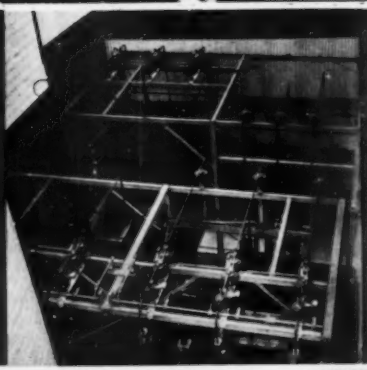
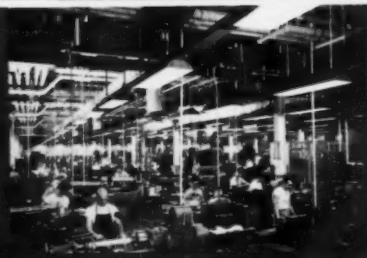
ELECTRICAL CONSTRUCTION AND MAINTENANCE





A McGRAW-HILL PUBLICATION 51ST YEAR

Mr. K. B. Jones, who was consulting electrical engineer for the MacCarthy interests, points out a bank of four capacitors located on top of the switch for a 300-hp motor in the air-conditioning system to Mr. R. E. Griffin of the General Electric Supply Corporation, Houston, who helped engineer the installation.

SHAMROCK HOTEL

saves $9120 per year

with GENERAL ELECTRIC CAPACITORS

The new Shamrock Hotel, in Houston, found it could make a 10 per cent saving in its power cost by overcoming low power factor caused by induction motors.

It installed 29 General Electric capacitor equipments—on or near the air-conditioning motors, the elevator motor-generator sets, and the pump motors of the cooling tower.

Total cost of all material—wire, conduit, circuit breakers, and the 1210 kvar of capacitors—was about $9100. Power factor was raised from 77% to 97%. Monthly saving in power costs has been $760. With this sort of savings, pay-off time will be just under 12 months!

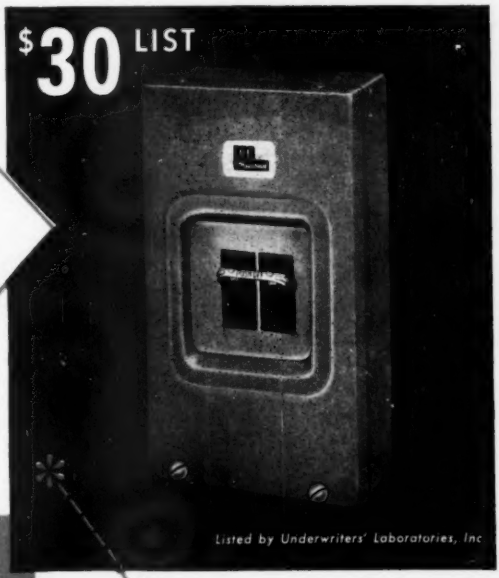
KEY TO LOWER POWER COSTS. The Shamrock Hotel is just one of hundreds of examples that can be cited where capacitors have cut power costs—or relieved overloaded wiring and transformers. If you haven't considered capacitors within the last two years, it will pay you to check, for the present-day price of capacitors in relation to other equipment has changed the picture of capacitor economics quite radically. Your local G-E sales office, authorized G-E agent, or G-E distributor is at your service. Or write to Section 407-206 for booklet GEA-5167 "A Way to Cut Power Cost." *General Electric Company, Schenectady 5, New York.*

GENERAL ELECTRIC

407-206

100 AMP. CIRCUIT BREAKER PROTECTION AT FUSE BOX PRICES

Another new Murray product



that gives you

Fully Magnetic! protection

LOW PRICE!

In the Murray 100 Amp. Service Control you get circuit breaker protection priced as low as comparable fused equipment.

MANY ADVANTAGES!

1. Fully magnetic circuit protection.
2. Carries full load regardless of temperature.
3. Plenty of room for easy wiring.
4. Compact (12-1/16 x 6-13/16 x 3-7/8 — indoor, surface type).
5. Easy to gang (No side handles).
6. Flush or surface mounting.

WHAT IS IT?

Service control equipment—3 wire, single phase, 120-240 Volts AC. Available in two types: 1—Indoor (surface or flush) or 2—Outdoor (raintight). Supplied with handle extensions for simultaneous manual tripping of two single pole independent trip fully magnetic circuit breakers in 70, 90, or 100 amps.

HOW IS IT USED?

1. Same application as a 100 amp. 3 wire fused switch with neutral or a 100 amp. 2 wire fused switch without neutral.
2. As Service Entrance Equipment.
3. As a main disconnect.
4. For protecting single phase lighting and appliance circuits or for fractional horse-power motor circuits.

IS IT AVAILABLE?

Yes! Call your distributor or contact your nearest Murray representative. Catalog numbers: Indoor—LV2IIA (Add S or F to indicate surface or flush mounting). Outdoor—LR2IIC (At slightly higher list price).

Murray®

FOR DETAILED INFORMATION, WRITE:

MURRAY MANUFACTURING CORPORATION

1250 Atlantic Avenue • Brooklyn 16, New York

Service Entrance & Meter Equipment · Magnetic Circuit Breakers · Switches
Current Limiting Reactors · Crows'nest Aerial Ladders

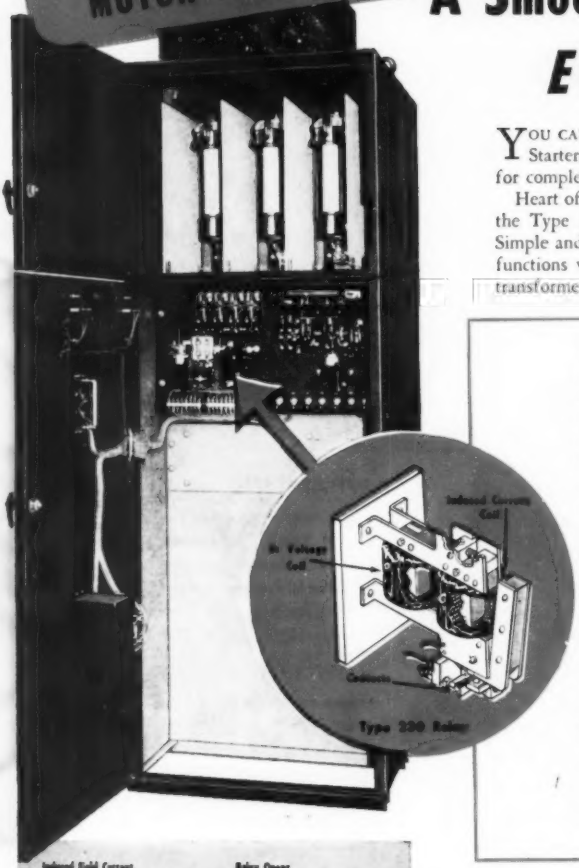
ALLIS-CHALMERS
Synchronous
MOTOR STARTERS

Dependable..

A Smooth, Accurate Start
EVERY TIME!

YOU CAN DEPEND on Allis-Chalmers Synchronous Motor Starters for accurate and consistent field application . . . for complete line-to-load protection.

Heart of the Allis-Chalmers Synchronous Motor Starter is the Type 230 polarized field-frequency application relay. Simple and dependable, this single relay performs all these functions without the use of primary potential or current transformers:



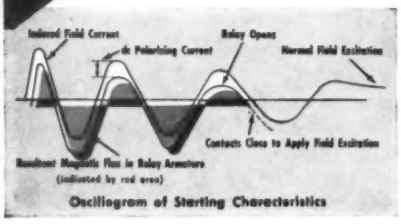
★ Applies dc excitation automatically when proper rotor speed is reached.

★ Selects exact half cycle and the most favorable angle between rotating field and revolving magnetic stator field to apply excitation.

★ If motor pulls out of step, it removes field excitation promptly at instant of pull-out.

★ Resynchronizes automatically after pull-out if condition has been corrected.

THIS IS HOW THE RELAY WORKS. The transformer action between the stator and the rotor of a synchronous motor (during acceleration) causes an alternating current to be induced in the field circuit of the rotor. A decrease in the magnitude and frequency of the induced rotor current as the motor accelerates, together with a biasing voltage from the excitation source, causes the Type 230 field application relay to apply field excitation at the most favorable point of stator-rotor relationship. The relay will maintain the field excitation during normal motor operation, but will operate to remove the excitation on motor pull-out. The relay will resynchronize the motor if the pull-out condition has been removed before protective devices operate to disconnect the motor from the line.



Oscillogram of Starting Characteristics

All Allis-Chalmers motor starters . . . those for synchronous, wound-rotor and squirrel-cage motors . . . give you everything you need for complete control and protection of your motors. The attractive, easy-to-install steel cubicles are compartmented to protect personnel — arranged for simplified maintenance. For more information, call your nearby A-C representative, or write Allis-Chalmers, Milwaukee 1, Wisconsin, for Bulletin 14B6410A.

A-3490

ALLIS-CHALMERS

There is an Allis-Chalmers Starter for Every Motor Need

ELECTRICAL CONSTRUCTION AND MAINTENANCE

With which is consolidated Electrical Contracting, The Electragist and Electrical Record . . . Established 1901

Published for electrical contractors, industrial electricians, engineers, consultants, inspectors and motor shops. Covering engineering, installation, repair, maintenance and management, in the field of electrical construction and maintenance.

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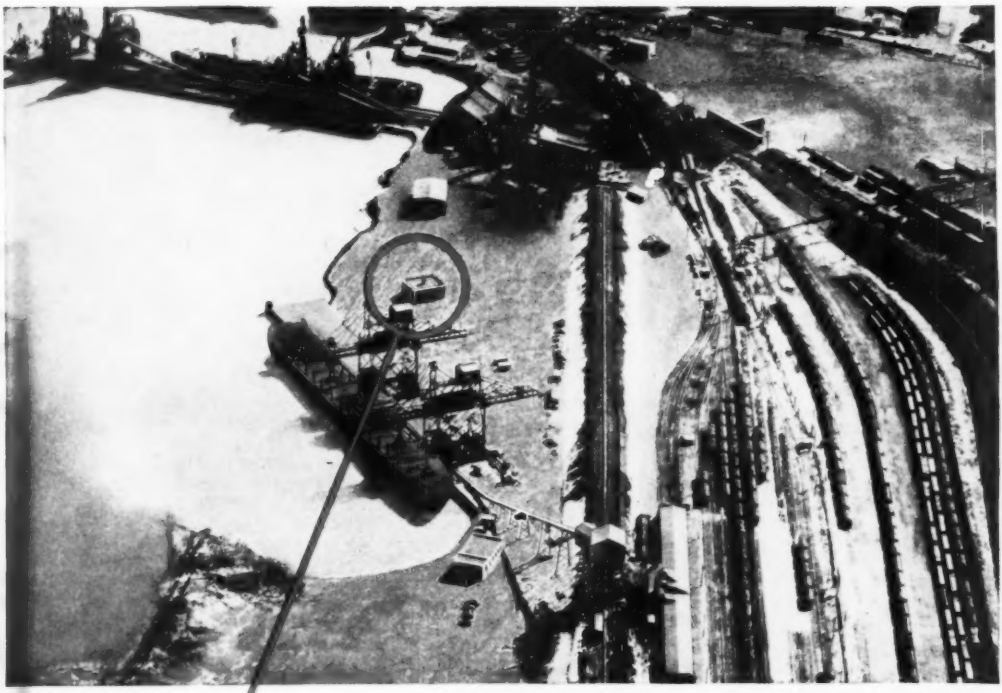
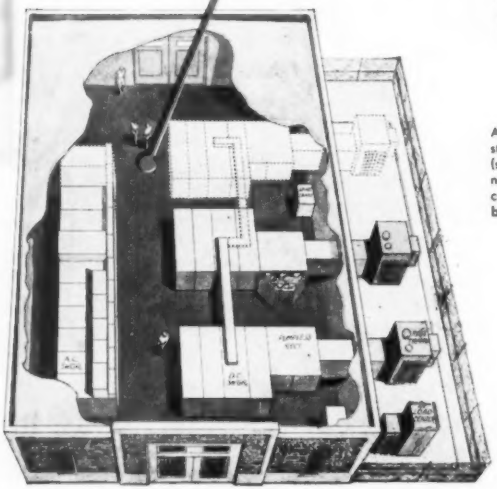
G-E switchgear protects operation



Aerial view of the new Baltimore and Ohio ore facility in the Curtis Bay section of the Port of Baltimore. Circled building marks location of the modern G-E substation equipment which supplies power for the two unloaders and two General Electric pusher locomotives that are used to spot gondola cars for loading.



Artist's drawing of the G-E substation showing two 1000 kw d-c substations, a-c substation and metal-clad switchgear. Additional units (sketched in phantom form) show location of the equipment that will be needed for future plans which call for doubling the present unloading capacity. Another d-c load center and two more switchgear units will be needed.

# of new $5,000,000 investment!

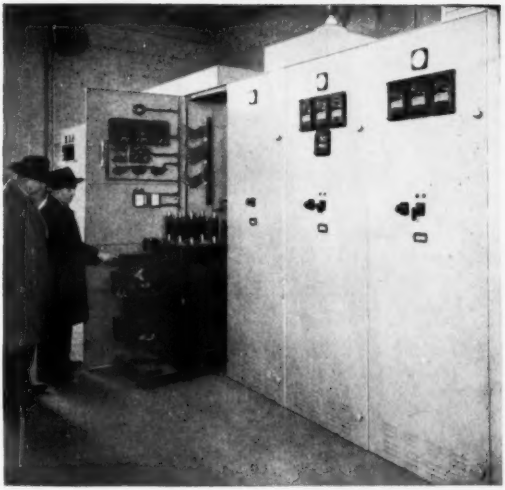
New B&O unloaders move 2000 tons an hour around-the-clock. Continuous power supplied with modern d-c substation and metal-clad switchgear.

Strategic ore from Liberia and South America takes less time to get to the nation's steel producing centers when it is unloaded at the Baltimore and Ohio's new ore facility in the Curtis Bay section of the Port of Baltimore.

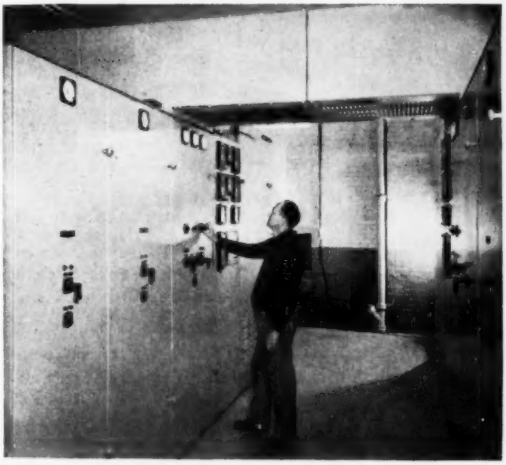
Incorporating the latest improvements in design and equipment, the new ore dock has a working capacity of 2000 tons an hour. The two highly efficient unloaders reduce turn-around time for ore boats and provide an almost continuous stream of ore-laden railroad cars for iron and steel mills. These same cars return to Baltimore loaded with coal, give B & O a two-way pay load for greater efficiency.

Continuous power for 24-hour operation is supplied by modern G-E substations. Two 1000 kw d-c substations supply the main power for the entire installation, while an a-c substation supplies auxiliary power and lighting. G-E metal-clad switchgear provides control and protection for the incoming and outgoing feeders to a-c and d-c load centers.

Forward-looking G-E engineers are ready to apply the knowledge gained from this, and hundreds of other installations, to *your* problems. Investigate today the many advantages of using General Electric switchgear in your plant for efficient, flexible power distribution. Contact your G-E sales representative, or write for bulletin GEA-3083 Metal-clad switchgear. General Electric Company, Schenectady 5, N. Y.



G-E metal-clad switchgear for the 13.2 kv feeders to a-c and d-c substations. All components are metal-enclosed for protection to personnel. Because units are factory-built and arrive ready to install, total installed cost is greatly reduced.



View of the operating aisle of the d-c substation. New G-E pumpless rectifiers provide continuous low-cost d-c power conversion. Minimum number of moving parts reduces maintenance. All parts are easily accessible.

GENERAL ELECTRIC

854-38

THE OLD WAY:
strong contrast
deep shadows

the
GUTH WYTE-LINER WAY:
low contrast
soft shadows

Here's a new idea in factory lighting to lift the eyestraining gloom off the ceiling:

ALL WHITE INSIDE—to reflect maximum light down and outward onto the working area.

ALL WHITE OUTSIDE—to reflect room light upward, brighten the ceiling and soften brightness contrast.

Easier to clean—reduces maintenance. Airflow Channel circulates air currents for longer ballast life.

GUTH Wyte-Liners are made in 2 and 3 lamp sizes for conventional 40-watt lamps and for 4- and 8-ft. Slimline. May we send you our 16-page Catalog 48-A with complete details?

Guth LIGHTING

THE EDWIN F. GUTH COMPANY / ST. LOUIS 3, MISSOURI

Leaders in Lighting since 1902

MORE AMPERES CAN RIDE THESE CABLES

You can do yourself and our country a service by installing Simplex-ANHYDREX XX Cables wherever you need to replace high voltage power cable.

Here's why. You can crowd more amps into the same size copper when it is insulated with Simplex-ANHYDREX XX. That's how you save copper. Of course your cables will run hotter but that's all right with Simplex-ANHYDREX XX insulation. This insulation is built to withstand 75°C. to 80°C. (167°F. to 176°F.), depending on operating conditions.

Simplex-ANHYDREX XX Insulated Cables can be used underground, directly in the earth, or in ducts, or they can be used overhead as aerial cables. The special Simplex neoprene jacket protects these insulated conductors from sunlight, oil, acids, alkalies, etc.

Want to know more about this versatile high temperature, high voltage power cable insulation that really combats moisture and water? Then return the coupon. No obligation, of course.

Simplex-ANHYDREX XX is a product of Simplex Research

SIMPLEX WIRES & CABLES

SIMPLEX WIRE & CABLE CO.
79 Sidney St., Cambridge 39, Mass.

SIMPLEX WIRE & CABLE CO.
79 SIDNEY ST., CAMBRIDGE 39, MASS.
GENTLEMEN: PLEASE SEND A COPY OF BOOKLET 1009A TO:

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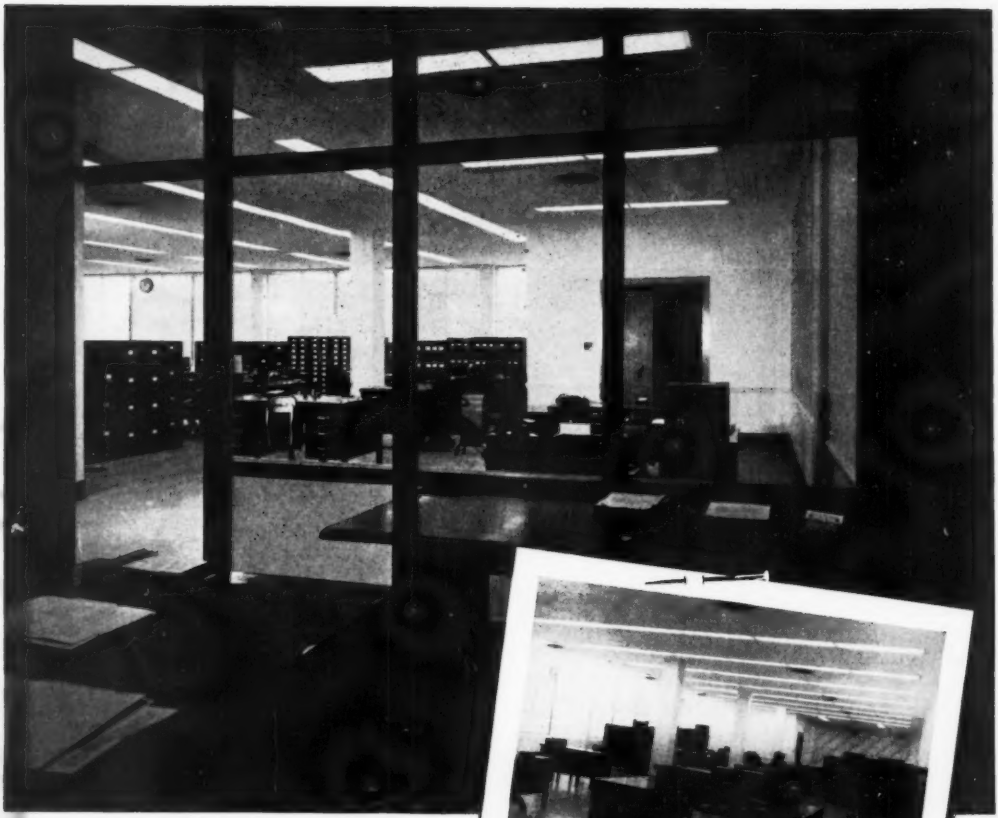


Planned Lighting

— BY LITECONTROL

JOB: Security Life & Trust Co., Winston-Salem, N. C.
AREA: Actuarial Department.
ARCHITECTS & ENGINEERS: Macklin & Stinson, Winston-Salem, N. C.
ELECTRICAL CONTRACTOR: Edmon Electric Company, Winston-Salem, N. C.
WALL FINISH: Cream with light green wall paper.
CEILING: White.
FIXTURES: LITECONTROL No. 5828 2-lamp recessed louvered slimline fixtures.
LAMPS: T12 96 Standard Cool White.
SPACING: 8 feet on centers.
INTENSITY: Average, 57 footcandles in service.

HERE, in the actuarial department of the Security Life & Trust Company, Winston-Salem, N. C., you see visual health safeguarded by LITECONTROL Planned Lighting . . . which was used throughout the building.

In this case, the right light, in the right amount, is being shed in the right place by means of LITECONTROL No. 5828 2-lamp recessed louvered slimline fixtures. For easy servicing, louvers are hinged and may be opened from either side with spring-loaded catches.

On your next lighting problem, call in your local LITECONTROL Representative for a consultation. It will cost you nothing. Yet, this man's experience in *Planned Lighting* may mean a difference to you in terms of time, trouble and money . . . *saved.*

LITECONTROL *Fixtures*
KEEP UPKEEP DOWN

LITECONTROL CORPORATION, 36 Pleasant Street, Watertown 72, Massachusetts

DESIGNERS, ENGINEERS AND MANUFACTURERS OF FLUORESCENT LIGHTING EQUIPMENT DISTRIBUTED ONLY THROUGH ACCREDITED WHOLESALERS

For Greater Production Efficiency...
FA POWER PLUGIN
The Midget Size Busduct, Now Available For Three Phase, Four Wire Service

Ⓕ Power Plugin, the midget size Busduct is the answer to today's demand for greater plant production efficiency. Available now for 4 wire 3 phase service, 3 wire 3 phase service and 2 wire, single phase. Ⓕ Power Plugin provides convenient plugin outlets all along the line, permitting machines to be moved in and out of production lines without slowing down or delaying operations.

Ⓕ Power Plugin provides 60 amp., main feeder capacity for ½ to 3 H.P. 240 volt motors, AC or DC, with conventional type fuses, and 7½ H.P. maximum with dual element fuses. In its new design Ⓕ Power Plugin also provides 208 volts single phase or three phase for power to motors, and 120 volts for light where individual illumination on machines is desirable. It also provides 120 volts for small pump motors on return lubrication systems.

Underwriters' Laboratories approved, Ⓕ Power Plugin is only 3½ inches wide and 2 inches deep in size. It is available in 5- and 10-foot sections with plug-in outlets every 20 inches; additional outlets on special order. Special lengths are also available for application on production benches and machines.

For further information on this new, convenient, flexible and efficient system of power distribution contact your nearest Ⓕ representative (he's listed in Sweet's) or write for Bulletin.

{ NEW Power Plugin Ⓕ Busduct is available to meet the need for greater capacities —225 to 1,000 amps, 600 volts. }

FA TRADE MARK

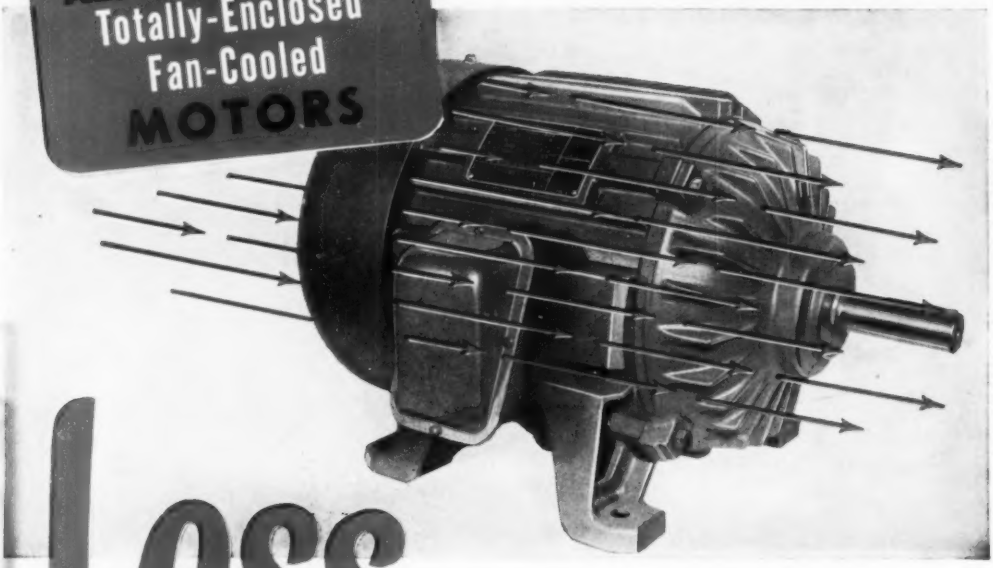
Frank Adam Electric Co.

BOX 357 • ST. LOUIS 3, MISSOURI

Makers of BUSDUCT • PANELBOARDS • SWITCHBOARDS • SERVICE EQUIPMENT • SAFETY SWITCHES • LOAD CENTERS • QUIKHETER

Our 60th Year

ALLIS-CHALMERS
Totally-Enclosed
Fan-Cooled
MOTORS



Less MOTOR CLEANING ...INSPECTION...OVERHAUL!

HERE'S A MOTOR that actually blows itself clean! Dirt is carried away by cooling air blown over the ribbed cast iron frame and bearing housings of this new Allis-Chalmers tefc motor.

Dirt can't build up to cause overheating. Concealed air passages and pockets have been eliminated. Even oily dirt that sticks can simply be wiped or blown off.

And this means savings! Maintenance costs are traditionally low on totally-enclosed, fan-cooled motors. But they're lower than ever before on the new Allis-Chalmers Type APZ tefc motor.

Rigid Construction

The frame is cast iron which has high resistance against corrosion and distortion. Bearings are pre-lubricated at the factory and should need no attention for years. Tapped holes with pipe plugs to permit regreasing and to provide grease relief are standard equipment.

Get All The Facts

The new Allis-Chalmers Type APZ totally-enclosed, fan-cooled motor is built in all NEMA standard frame sizes from 224* to 505. Also in explosion-proof type. Your A-C Authorized Distributor or District Office has complete information. Call today, or write Allis-Chalmers, Milwaukee 1, Wisconsin. Ask for Bulletin 51B7225.

A-3426

Sold . . .
Applied . . .
Serviced . . .

by Allis-Chalmers Authorized Dealers, Certified Service Shops and Sales Offices throughout the country.

CONTROL — Manual, magnetic and combination starters; push button stations and components for complete control systems.

TEXROPE — Belts in all sizes and sections, standard and *Vari-Pitch* sheaves, speed changers.

PUMPS — Integral motor and coupled types from ¾ in. to 72 in. discharge and up.

Texrope and Vari-Pitch are Allis-Chalmers trademarks.

ALLIS-CHALMERS

*Similar design non-ventilated motors Type APK, also available in frames 203 to 224 inclusive.

which of these feed-in duct features *rate highest with you?*

architects

rate these SQUARE D features particularly high:

lowest known voltage drop . . . maximum efficiency, minimum power loss

smallest cross-sectional area . . . conserves valuable installation space

contractors

give these features top billing:

reduced installation time . . . simplified components, factory prefabrication

new joint design (*lower right*) . . . all joint ends identical, connection bolts face outward

interchangeable standard fittings . . . permit horizontal or vertical riser applications

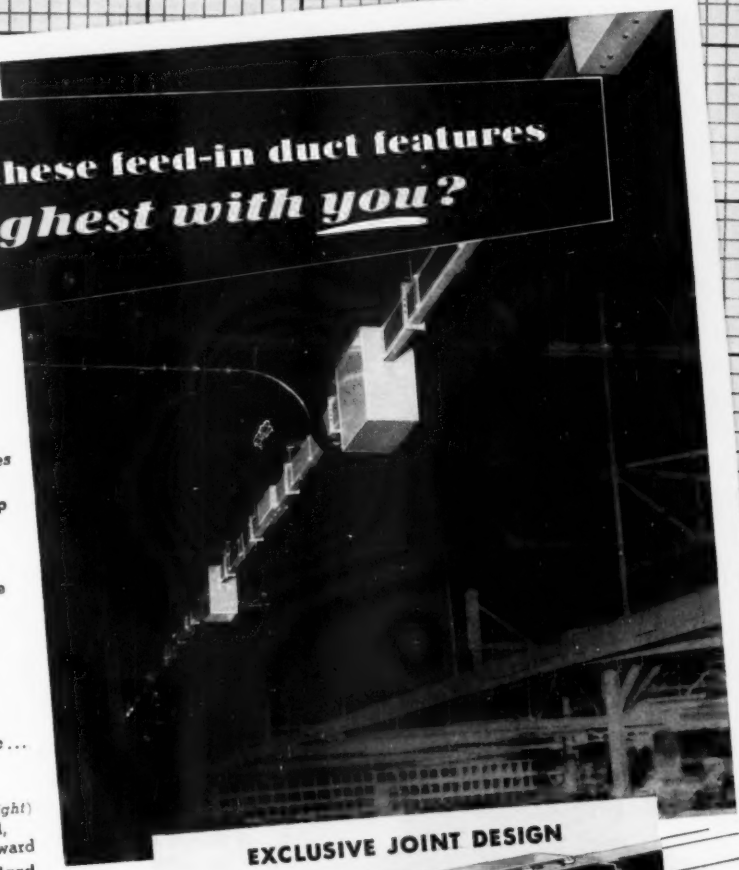
users

vote these SQUARE D features tops:

low cost installation and maintenance . . . most accessible connections

totally enclosed . . . permanent safety construction, excludes dust

completely reuseable . . . rearrangement with the same components



EXCLUSIVE JOINT DESIGN

SQUARE D's **exclusive** joint design saves installation time and reduces maintenance cost. Joint ends are identical—unnecessary to select mating ends before positioning or hanging duct sections. Outward-facing, pre-installed bolts permit rapid assembly and easy maintenance.

ASK YOUR ELECTRICAL DISTRIBUTOR FOR SQUARE D PRODUCTS

SQUARE D COMPANY

DETROIT · MILWAUKEE · LOS ANGELES

SQUARE D COMPANY CANADA LTD., TORONTO • SQUARE D de MEXICO, S.A., MEXICO CITY, D.F.

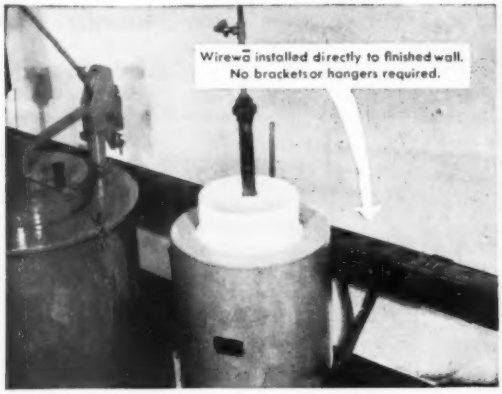
Accurately made hinged couplings speed installation . . . add rigidity to sections for lifting into place . . . serve as hangers.

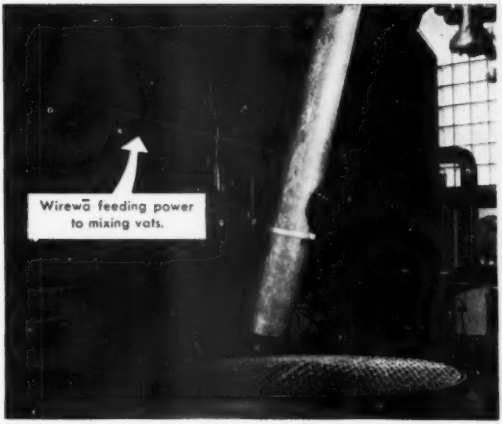
National Electric 4x4 WIREWĀ for Speedy INDUSTRIAL

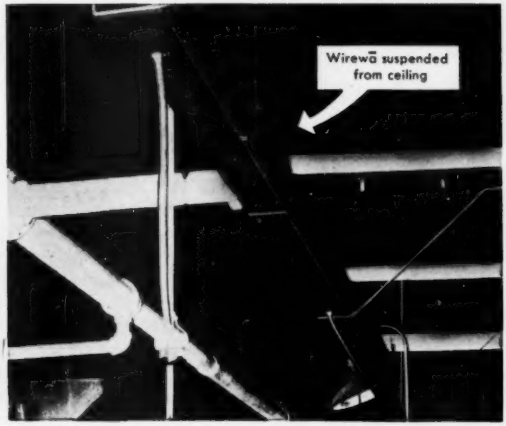
Electricians and plant men like 4 x 4 Wirewā for protecting electrical wiring—for wiring that may be changed, tapped or spliced frequently. NE Wirewā provides *rugged steel protection* plus *accessibility* unequalled by any other type of wiring.

- **Easy to reach for wiring changes**
- **Plenty of room . . . 16 square inches of wireway for wire fills**
- **Multiple KO's for conduit take-offs**
- **Quick, easy to install. Complete line of fittings**
- **Low maintenance**
- **Easy to reroute and extend . . . 100% salvable**

a Wirewā you'll like!







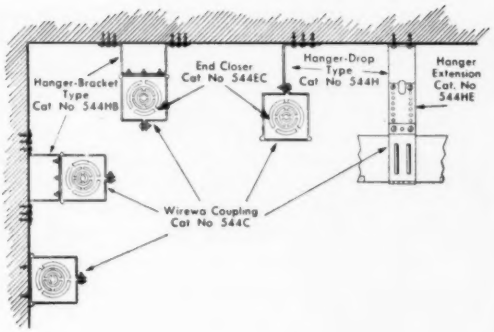
WIRING, EXTENSIONS and RELOCATIONS

4x4 WIREWĀ FILL TABLE
ALL ONE SIZE WIRE

Wire Size	Area of Rubber Covered Wire—Square Inches		Maximum Number of Wires—All of One Size	
	Types R, and RH	Types T, and TW	Types R, and RH	Types T, and TW
14	.023	.013	139*	246*
12	.027	.017	118*	188*
10	.046	.022	69*	145*
8	.076	.040	42*	80*
6	.123	.081	26	39*
4	.16	.108	20	29
2	.21	.147	15	21
1	.27	.202	11	15
1/0	.31	.236	10	13
2/0	.35	.278	9	11
3/0	.41	.328	7	9
4/0	.48	.390	6	8
250M	.59		5	
300M	.68		4	
400M	.83		3	
500M	.98		3	

No. 14 to 8, solid wire; No. 6 and larger, stranded.
*Maximum number of conductors limited to 30, except as noted in N.E. Code.

Methods of Hanging 4x4 Wirewā


Hanger-Bracket Type Cat No 544HB
End Closer Cat No 544EC
Hanger-Drop Type Cat No 544H
Hanger Extension Cat. No 544HE
Wirewa Coupling Cat No 544C

Listed by Underwriters' Laboratories, Inc.

Sold through electrical wholesalers everywhere.

EVERYTHING IN WIRING POINTS TO

National Electric
PRODUCTS CORPORATION
1301 CHAMBER OF COMMERCE BLDG. • PITTSBURGH 19, PA.

Rely on Quality

INDUSTRIAL

PYLE-NATIONAL LIGHTING FIXTURES

for longer service life, added Safety and Efficiency

EXPLOSION-PROOF

Pyle-National LE Series (Class 1, Groups C and D)

For use in locations where highly flammable materials are manufactured or handled.

Rugged, flame-tight cast aluminum alloy housings render internal explosions harmless, and insure safe operating temperatures. Threaded construction permits easy access to interior for wiring and lamp replacement. Available in many types and sizes.

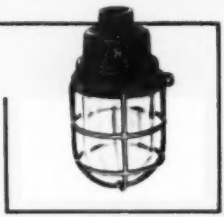
DUST-TIGHT

Pyle-National DE Series (Class II, Group E, F, G and Class III)

For use in locations where flammable dusts are present in quantity.

Strong, one-piece cast aluminum alloy housings are designed to exclude dust from the interior and to avoid accumulation of dust on the exterior surface. Available in many types and sizes.

VAPOR-TIGHT



Pyle-National BO Series

For use in any outdoor or indoor location subjected to heavy concentrations of non-flammable vapors, gases, dusts, or moisture.

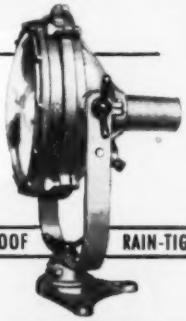
Heavy duty construction and especially efficient sealing features insures an exceptionally long service life. Full line for 10 to 200 watt lamps.

VAPOR-TIGHT SIGNAL OR PILOT LIGHTS

Midget Fixtures for 10 watt Lamps.

ENCLOSED FLOODLIGHTS

Sealed against moisture and dirt, constructed throughout of cast aluminum and other rugged, corrosion-proof materials, Pyle-National floodlights retain their original high-efficiency output throughout an exceptionally long service life, with negligible maintenance and replacement expense.



WEATHER-PROOF RAIN-TIGHT

SINCE 1897

THE PYLE-NATIONAL COMPANY

1344 N. KOSTNER AVENUE • CHICAGO 51, ILLINOIS

District Office and Representatives in Principal Cities of the United States. Export Department: International Railways Supply Co., 30 Church St., New York. Canadian Agent: The Holden Co., Ltd., Montreal, Toronto, Winnipeg, Vancouver.

CONDUIT FITTINGS • PLUGS AND RECEPTACLES • TURBO-GENERATORS • GYRALITES • MULTI-VENT AIR DISTRIBUTION

Century 1 TO 400 H.P. MOTORS

Choose From These Many Types To Fit Your Job

DEPENDABLE CONSTRUCTION . . . Plus

PROPER SELECTION MINIMIZE SHUTDOWNS

Century Electric Company is celebrating its 50th year in the electrical industry.

It's easy to select the proper electric motor for your job from Century's complete line—from 1/6 to 400 horsepower. A wide range of types and kinds are available to satisfy all popular requirements. They are carefully designed, built and tested to assure maximum performance throughout their long life.

Here are examples of Century's line of INTEGRAL HORSEPOWER motors.

Polyphase

TYPE SC—Open Drip proof General Purpose Motor. Meets the needs of most installations where operating conditions are relatively clean and dry.

TYPE SC—Splash proof. Supplies protection where plants must be washed down. Keeps out all falling or splashing liquids—rain, snow, sleet, etc.

TYPE SC—Totally Enclosed Fan Cooled. Protects against dusts, mist, oil, fog. Inner frame protects vital parts of the motor, seals out harmful matter.

TYPE SC—Explosion proof. Protects life and property in atmospheres charged with explosive dusts or gases.

TYPE SR—Wound Rotor. Open Construction. Ideal for applications requiring low starting current with high starting torque, reversing or adjustable speed.

TYPE SR—Wound Rotor Splash proof. Same electrical characteristics as motor shown above. In addition, gives adequate protection against falling and splashing liquids.

Single Phase

TYPE RS—Repulsion Start Induction, Open Construction, Single Phase Brush Lifting Motor. Combines high starting torque with low starting current.

683

TYPE RS—Splash proof. Same advantages as open construction, plus protection against splashing and falling liquids.

TYPE CSH—Capacitor Start Induction, Single Phase Motor. Suitable when high starting torque with normal starting current is satisfactory.

TYPE CSH—Splash proof. Same advantages as motor shown above, plus protection against falling and splashing liquids.

Direct Current

TYPE DN—Direct Current Motors. Suitable for use where direct current is available, or its use desirable.

TYPE DN—Direct Current, Splash proof.

TYPE SY—Synchronous. Suitable for continuous operation at a uniform load for power factor correction.

In addition to a complete line of integral horsepower motors, Century offers fractional horsepower motors, gear motors, generators, AC and DC motor generator sets.

For a long life of satisfactory performance, specify Century motors for all your electric power requirements.

CENTURY ELECTRIC COMPANY, 1806 Pine Street, St. Louis 3, Missouri • Offices and Stock Points in Principal Cities

You can't buy Better Fittings or ones that cost less to use

Cross Section Showing Indentations.

Quicker to use and neater in appearance, Briegel All-Steel Indenter Fittings not only make stronger connections but also make each job more profitable to the contractor and satisfactory to his customers.

Two Easy Squeezes and they're set to stay. It is only natural that the Briegel All-Steel Indenter Fittings are the most widely used E.M.T. connectors and couplings. Contractors the world over recognize their cost cutting qualities and the fact that they make each wiring job neater, stronger and better.

All B-M Fittings Carry the Underwriters Seal of Approval

BRIEGEL METHOD TOOL CO.

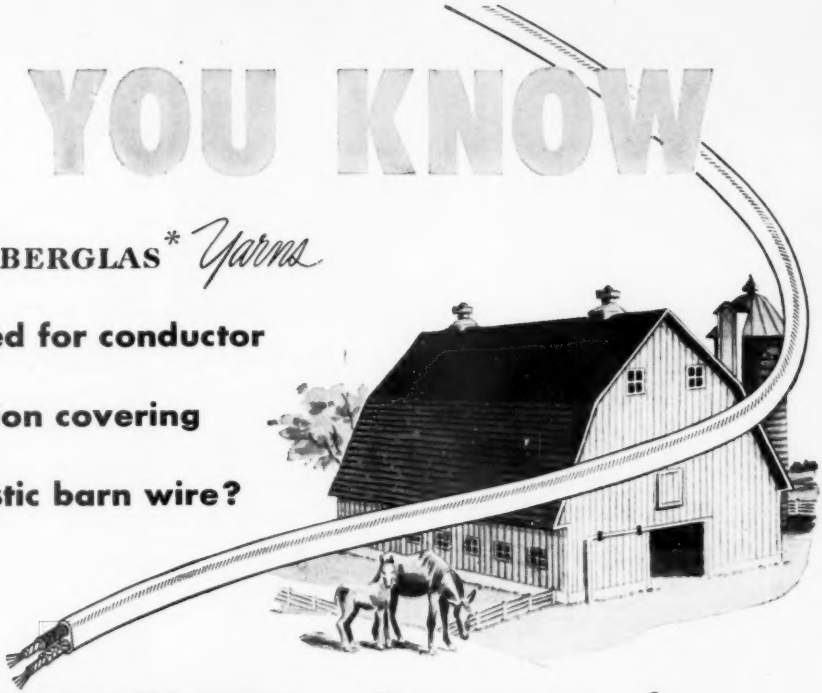
GALVA, • ILLINOIS

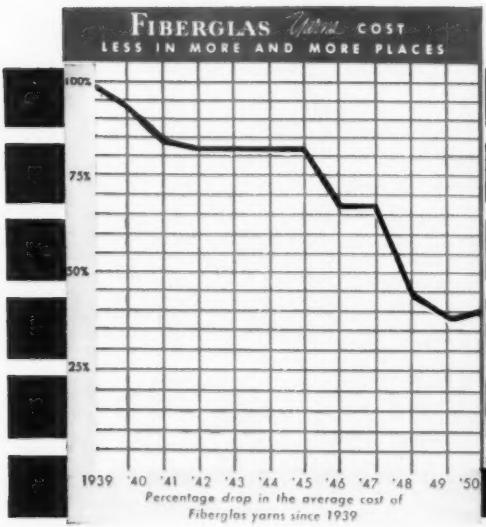
DISTRIBUTED BY

The M. B. Austin Co., Northbrook, Ill.; Clayton Mark & Co., Evanston, Ill.; Clifton Conduit Co., Jersey City, N. J.; General Electric Co., Bridgeport, Conn.; The Steelduct Co., Youngstown, Ohio; Enameled Metals, Pittsburgh, Penn.; Kondu Mfg. Co., Ltd., Preston, Ont.; Wagner Malleable Products Co., Decatur, Ill.

DO YOU KNOW

why FIBERGLAS* *Yarns* are used for conductor insulation covering on plastic barn wire?




FIBERGLAS Yarns COST
LESS IN MORE AND MORE PLACES
100%
75%
50%
25%
1939 '40 '41 '42 '43 '44 '45 '46 '47 '48 49 '50
Percentage drop in the average cost of Fiberglas yarns since 1939

FIBERGLAS *Yarns*

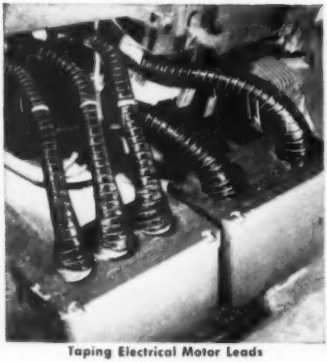
- WILL NOT ABSORB MOISTURE
- WILL NOT ROT
- RESIST CHEMICALS, ACIDS
- HAVE GREAT TENSILE STRENGTH
- HAVE LOW BUILD-UP
- ARE LOW IN COST!

*Fiberglas is the trade-mark (Reg. U. S. Pat. Off.) of Owens-Corning Fiberglas Corporation for a variety of products made of or with glass fibers.

For complete information about Fiberglas Yarn for this and other uses, write Owens-Corning Fiberglas Corporation, Dept. 856, 16 E. 56th Street, New York 22, N. Y.

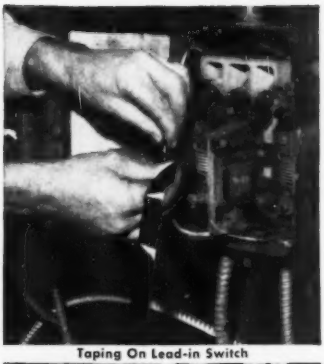
OWENS-CORNING FIBERGLAS *Yarns*

FIBERGLAS IS IN YOUR LIFE . . . FOR GOOD!



Taping Electrical Motor Leads

Splicing Leads on Control Switch



Taping On Lead-in Switch

DUTCH BRAND PLASTIX ELECTRICAL TAPE

... for hundreds of special uses

Neat Splicing for Limited Space

DUTCH BRAND PLASTIX meets those many special requirements for a superthin conforming tape with high dielectric resistance for use where space is limited. PLASTIX has great flexibility and stretch . . . it tears readily in spite of its strength and it resists weather, oil, acids, alkalies and corrosion.

It is available in the regular .007" gauge for general service or .010" gauge for heavy duty work. Dielectric resistance is more than 1000 volts per mil of thickness. Specify DUTCH BRAND the next time you order.

Application in Junction Box

also

DUTCH BRAND Friction and Rubber Tapes

AVAILABLE AT YOUR JOBBERS

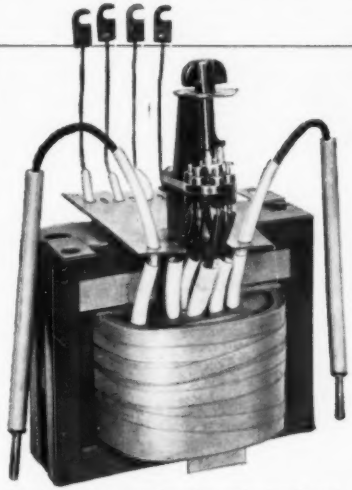
VAN CLEEF BROS. INC.

Manufacturers . . . Rubber Products . . . Est. 1910

7900 WOODLAWN AVENUE • CHICAGO 19, ILLINOIS

15% Smaller

IN SIZE AND WEIGHT WITH SAVINGS IN OPERATING COSTS



New internally operated tap changer has handle and position indicating dial plate above the oil level.

FORMER FEATURES RETAINED

Where tank wall high voltage bushings are specified, *Curvacore* transformers retain the simplified angle bushings with handy chuck-type connector.

The *Curvacore* transformer tank is *Spra-Bonderized* and then a 3-coat baked-on finish of alkyd-resinous paint is added.

The Curvacore transformer is constructed with the same high quality craftsmanship. Each transformer is thoroughly tested electrically and mechanically.

You can get higher flux carrying capacity and lower hysteresis losses with the new *Curvacore* distribution transformer. The new transformer with its redesigned core and other improvements gives better performance though reduced in size and weight 15%.

The core of the *Curvacore* transformer utilizes strips of cold rolled steel, shaped to follow the natural path of the magnetic flux. Steel strips are wound, shaped, annealed and cut into two-turn lengths. Each length is fed through the coil structure and then resumes its original curved shape.

The *Curvacore* transformer can yield real savings in operating costs over the years. Here are the advantages of the new design:

1 EXCITING CURRENT REDUCED BY ONE-HALF
Wound core design provides a more efficient path for the magnetic flux.

2 BETTER RATIO OF COPPER-IRON LOSSES
New core design gives better balanced arrangement of core steel to copper.

3 REGULATION IMPROVED UP TO 15%
Low reactance of design results in lower impedance.

4 THERMAL CAPACITY IMPROVED
Increased cooling area within the windings reduces the copper-to-oil temperature gradient. Improved cooling results in added years of service life.

5 SIZE AND WEIGHT REDUCED BY 15%
The reduction in size and weight makes the *Curvacore* transformer easier and cheaper to handle and to install.

Curvacore TRANSFORMERS

Economies resulting from these features mean all-around savings for your system and make the *Curvacore* transformer a good investment.

The *Curvacore* transformer is now available in ratings of 25 kva and lower. Higher ratings will soon be available.

For more information on the new *Curvacore* distribution transformer, call your local A-C sales office or dealer. Or write Allis-Chalmers, Milwaukee 1, Wis. A-3418

Curvacore is an Allis-Chalmers trademark.

ALLIS-CHALMERS

3 months old and making safety-switch history!

BULLDOG VACU-BREAK MASTER SAFETY SWITCH

Contractors hail safety switch simplification program as long-needed forward step. Now, *one* great line of 38 Bull-Dog Vacu-Break Master Switches fills all safety switch requirements! These Type A switches . . . selling at C prices . . . are made possible only by concentrating our switch production on this one sensible, simplified line. Now, forget the hundreds of confusing, complex switch catalog numbers . . . *work with just 38!* Save time, money, effort wherever you stock, use or recommend Type A, C or D safety switches.

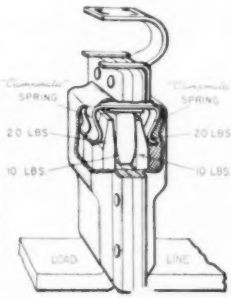
THIS GREAT SAFETY SWITCH PROGRAM HAD TO COME! And BullDog pioneered it! Now only three months old, it's already a whacking success from coast to coast! And no wonder.

Now, one great, simplified line of just 38 BullDog Master Safety Switches . . . every one a Type A switch . . . fills your every requirement . . . AT TYPE C PRICES.

For descriptive folder and further details, write DEPARTMENT 453-B today, or get in touch with your local BullDog Distributor.

Exclusive Clampmatic Contacts!

"Clampmatic" is a method for obtaining extra and enduring contact pressure between switch jaws and blades. In ordinary switches, jaws exert about 10 lbs. pressure on blade. In Vacu-Break Switches, the Clampmatic spring augments this with 20 lbs. on both "line" and "load" sides of jaws. Thus, Clampmatic provides a total of 30 lbs. of contact pressure between both sides of blade and jaw for "bolt-tight" contact.



A Type A Switch at Type C prices!

All the famous BullDog features!

- Vacu-Break principle of circuit rupturing
- Self-aligning Clampmatic Contacts
- Quick-make and quick-break
- Anti-creepage corrugations on switch bases and arc chambers
- Solderless cable terminals (wire grips)
- Horsepower-rated
- Silver-surfaced current-carrying parts
- Voidable cover interlock
- Spring-reinforced fuse grips
- Ample supply of concentric K.O.'s
- Generous wiring space in all switches

Just 38 great Master Vacu-Break Switches replace hundreds of Type A, C and D safety switches. Write Dept. 453-B for descriptive folder.

BULLDOG

BULLDOG ELECTRIC PRODUCTS COMPANY

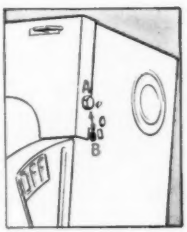
DETROIT 32, MICHIGAN • FIELD OFFICES IN ALL PRINCIPAL CITIES
IN CANADA: BULLDOG ELECTRIC PRODUCTS OF CANADA, LTD., TORONTO

THE LEADER IN FLEXIBLE ELECTRICAL DISTRIBUTION

Voidable Cover Interlock!

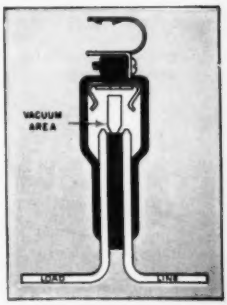
Interlock: With interlock pin at Hole A, cover cannot be opened unless switch is OFF. Cover must be fully closed to throw switch ON.

To void interlock: Simply push interlock up and insert interlock pin in Hole B. Switch can then be thrown ON or OFF with cover open or closed.

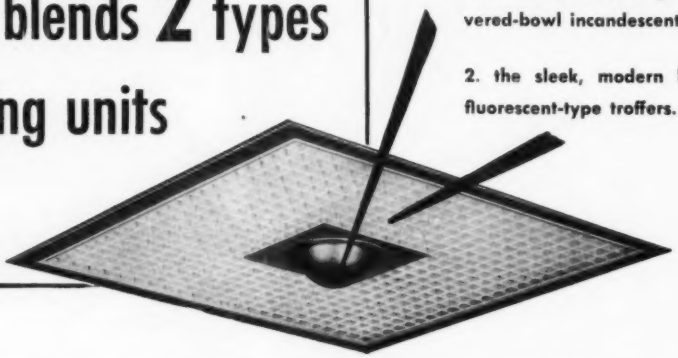


Exclusive Vacu-Break Principle!

Dangerous arcs are quickly snuffed out by lack of oxygen in BullDog's exclusive Vacu-Break arcing chamber. This eliminates excessive arcing which, in ordinary switches, causes burning, pitting and rapid deterioration of contacts. Thus, the BullDog Vacu-Break chamber materially reduces switch maintenance.



Skylike® blends 2 types of lighting units into 1



1. the soft, indirect light of silvered-bowl incandescent lamps.

2. the sleek, modern look of fluorescent-type troffers.

Silvray's SKYLIKE lighting system offers your commercial customers many advantages not found in any other lighting system, yet uses only silvered-bowl incandescent lamps.

Designed along modular concepts for recessed or semi-recessed use, SKYLIKE fixtures may also be surface-mounted in old or remodeled interiors without sacrifice in lighting quality.

Silvray SKYLIKE units are amazingly economical in initial cost — only ½ to ⅓ as much as other equipment delivering comparable results. Fixtures fit 24" x 24" ceiling tile . . . are light in weight for quick installation. Simplicity in wiring and construction eliminates costly service call-backs. In addition, your customers take advantage of continued maintenance savings, for SKYLIKE units can be relamped from the floor and require only an occasional cleaning with a damp cloth.

Here's *real* proof of SKYLIKE efficiency

These unretouched photographs demonstrate the versatility of the SKYLIKE louvered incandescent lighting system.

In each case, the only light source used was that of the SKYLIKE units — note the soft, even distribution of light . . . the complete absence of glare, harsh shadows, and sharp light cut-off lines.

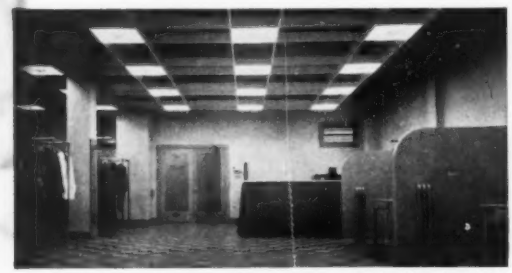


Photo by Milton Mann Studios

A unique SKYLIKE application is pictured here in the showroom of Irving A. Belking Furs in San Francisco, California.

Notice how architect Bernard J. Saboroff's gridwork of 1 x 6 pine serves to hide the unsightly high ceiling, as well as to support the patterned group of recessed Silvray SKYLIKE units. Low brightness levels and 90° shielding provide an extremely satisfactory result.

Selected for warm color and ease of installation, surface-mounted SKYLIKE units replaced out-moded globe-type units in the remodernization of the Levy Brothers Store in Elizabeth, N. J.

Variable lamp sizes — from 150 to 500 watts — permit day-to-day changes in lighting intensities. Units can also be converted for accent or directional lighting by use of a semi-silvered lamp and accessory.

Distributed by GraybaR

Send for complete SKYLIKE information. A comprehensive booklet describing the SKYLIKE system is yours for the asking. To get your copy, write Graybar Electric Company, Inc., Graybar Building, 420 Lexington Avenue, New York 17, New York. S18-411

SKYLIKE LIGHTING INC.

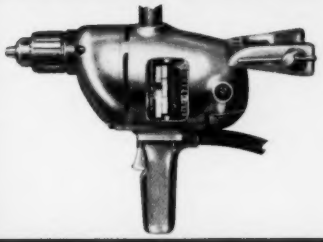
SKYLIKE

. . . A SILVRAY ASSOCIATED COMPANY

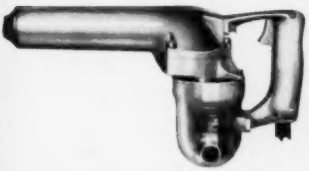
Switch... to Black & Decker POWER

BLACK & DECKER ¼" HOLGUN* is lightweight, compact, great for drilling in close quarters. It's just one of 25 B&D Drills you have to choose from in capacities from ¼" to 1½"—with a choice of power, speed and price in most capacities—for faster drilling in wood, metal or masonry.

BLACK & DECKER ½" STANDARD DRILL is the world's most popular general-purpose drill. Drives twist drills, Hole-Saws and wood augers for drilling joists and steel boxes; installing switch boxes and switch boards; cutting through switch and terminal boxes in BX work; deep boring in heavy timbers, creosote planking.



BLACK & DECKER 1⅛" ELECTRIC HAMMER is one of four models that speed up any job involving concrete, brick or stone. These amazingly husky tools drill straight, clean holes for anchors or conduit—dig channels for laying conduit—strip flooring, drive fasteners, clean and scale metal. Drive a variety of tools for bushing, caulking, chiseling, etc. Compact, completely self-contained, operate on AC or DC without transformer or extra equipment.



B&D RIGHT ANGLE ATTACHMENT helps you drill in close quarters, like reaching out-of-the way places on joists. Transmits full power. Maintains correct spindle speed. Attaches to B&D ½" Standard and larger Drills.

B&D HOLE SAWS cut clean, round holes *faster*—in wood, steel, plastics, fiberboard, alloys. Naturals for cutting through switch and terminal boxes in BX work. Fine-teeth, coarse-teeth and high-speed styles—complete range of sizes from ⅞" to 4" diam.; mandrels to fit all electric drills.

To make your jobs go FASTER, buy these speedy Black & Decker TOOLS

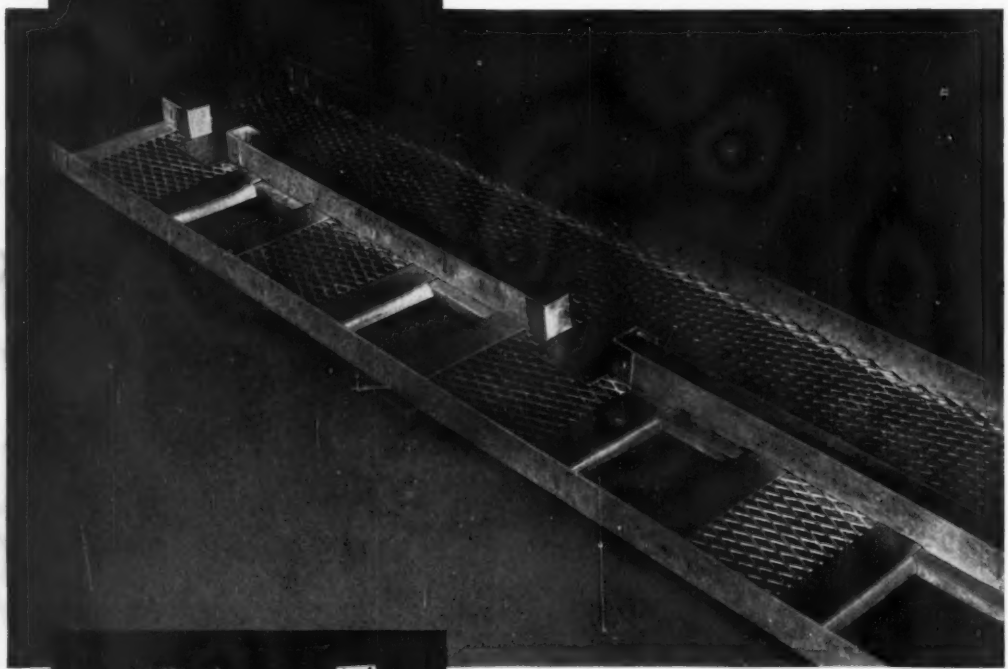
See your nearby Black & Decker Distributor for demonstrations of the *world's most complete* line of portable electric tools. See for yourself how they'll save you time, money and muscle on scores of electrical jobs. WRITE TODAY for free, detailed catalog to: THE BLACK & DECKER MFG. CO., 697 Pennsylvania Ave., Towson 4, Md.

BD Black & Decker PORTABLE ELECTRIC TOOLS

*Trade Mark Reg. U. S. Pat. Off.

This message is for you...

HAVING UNUSUAL PROBLEMS WHICH REQUIRE SPECIAL DESIGNS OF CABLE TROUGH



T.J. Cope INC.

YOU KNOW COPE BY THESE PRODUCTS

There are many cases where installation of cable trough creates this "puzzling problem": *How* should it be designed to fit a particular situation?

That needn't cause you any worry, though, because Cope is solving such individual problems daily. Where a Design Engineer is concerned over a "perplexing situation", all he has to do is outline the problem to our Engineering Staff, and the solution comes from us. Cope Engineers design special fittings which adapt the standard Troughs to your specified job.

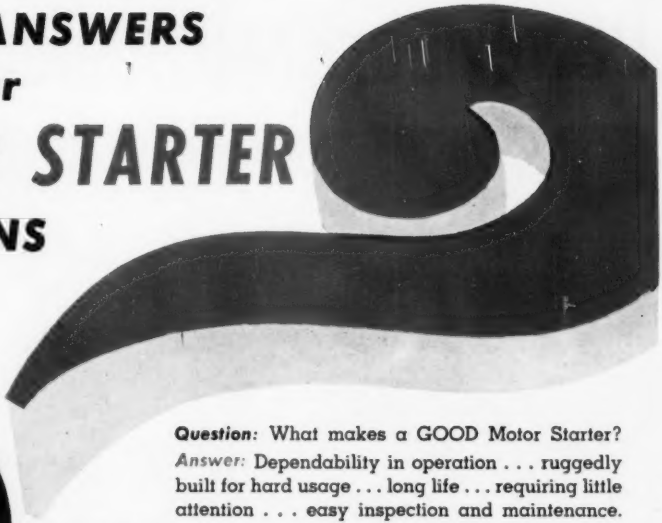
We offer you the services of our Engineers when special fittings are required, and urge you to submit your problems to us.

You will quickly discover—as have hundreds of users—that the new Cope Cable Trough with its simplified design actually saves you *three ways*: material, labor and costs.

Request full information on Cope Cable Trough from us today.

T. J. COPE, INC., 711 SOUTH 50th ST.
PHILADELPHIA 43, PENNSYLVANIA

Here are the ANSWERS to your AC MOTOR STARTER QUESTIONS



Question: What makes a GOOD Motor Starter?

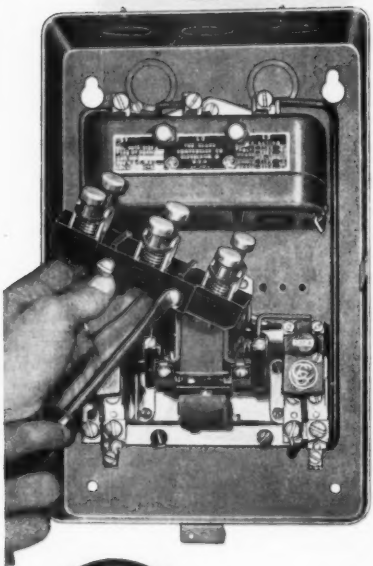
Answer: Dependability in operation . . . ruggedly built for hard usage . . . long life . . . requiring little attention . . . easy inspection and maintenance.

Question: What makes the new CLARK Type "CY" different?

Answer: An entirely new, advanced principle of arc interruption; combining strong, multi-turn magnetic blowouts and twin-break contacts.

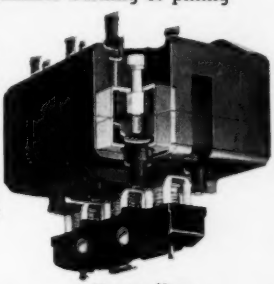
Question: How does this improve its operation?

Answer: Constant forced rotation of the arc—moving continuously from a hot to a cold spot, minimizes burning or pitting of contacts.



Question: How about maintenance?

Answer: Longer contact life means less service. No filing, dressing or cleaning of contacts required. No tools necessary to inspect contacts. Contacts, coils and other components easily changed. The CLARK Type "CY" is the maintenance man's dream!



Phantom View
Showing Arc Shield

Question: Is it rugged?

Answer: Mill Type heavy-duty construction and design provide extra protection and dependable operation in severe service.

Question: Any other advantages?

Answer: Many—among them the ingenious design of the solid upper arc shield that prevents accumulation of hot gases between wiring terminals, minimizing phase-to-phase failures.

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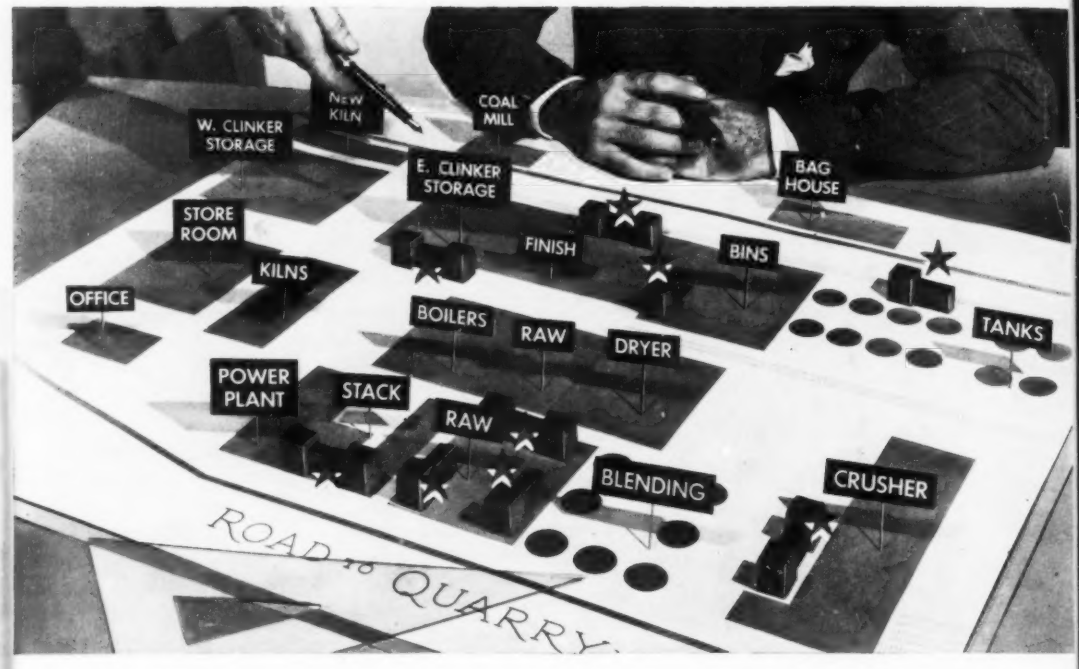
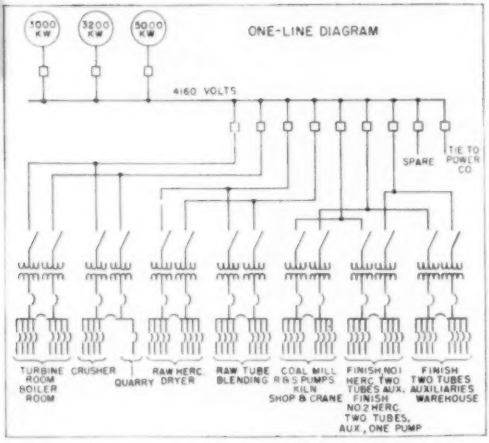
Dewey Portland Cement Co. solves



Modernized System gives additional capacity



One-line diagram showing new load-center distribution system. Turbine-generators supply voltage at 4160 volts wye. High voltage is stepped down to utilization level 480Y/277-v right in the load areas. Two sources of power for each load-center unit assure the 24-hour-a-day service.

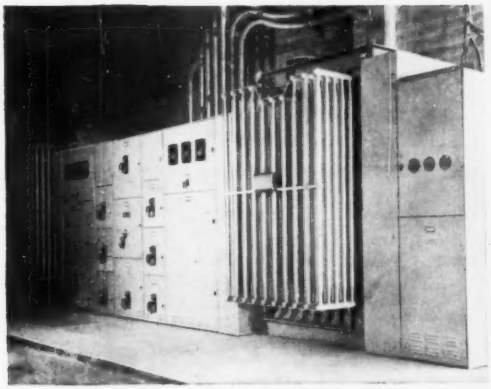
For 30 years, waste heat from the cement kilns has enabled the Dewey Portland Cement Company to generate most of its power. Additional power for peak loads and emergency conditions is supplied by a local utility.

Recently, increasing demands exceeded the capacity of the Company's two turbine generators, rated 3200 kw and 3000 kw, both at 480 volts. Since inadequate interrupting capacity of the switchgear equipments prevented further use of the local utility power, a critical problem developed.

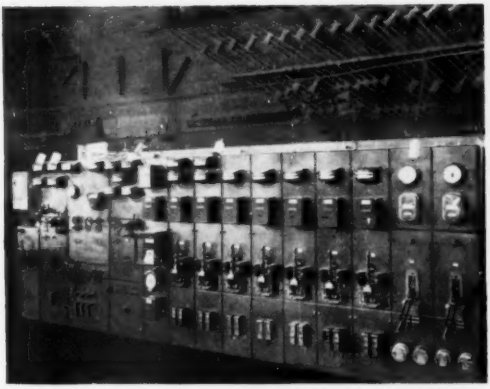
LOAD CENTER

POWER DISTRIBUTION SYSTEMS

a critical power supply problem



Double-ended load-center unit rated at 3000 kva. Seven of these are located throughout the plant. Since all units are the same size, it was possible to standardize switches, transformers, and breakers.



Old switchboard with exposed switches and conductors threatened safety of plant and personnel. Old oil circuit breakers could not provide adequate interrupting capacity if short circuit occurred.

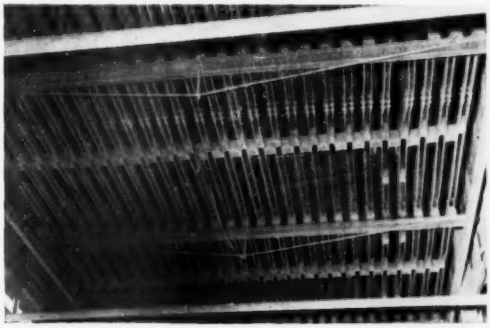
Load-center distribution key to power expansion

Called in by the Dewey Portland Cement Co., Dewey, Okla., G-E engineers found that an additional 5000 kw required by the plant could be supplied by a modern General Electric turbine generator, utilizing available waste heat.

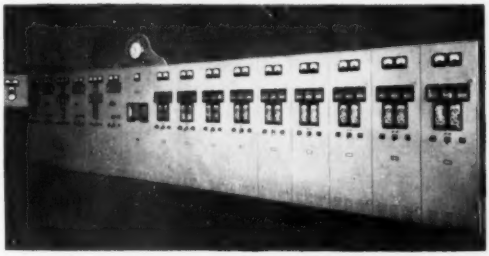
G-E specialists recommended a generated voltage of 4160 wye. Existing 480-volt generators were rewound and load-center unit substations were used to step down the voltage to utilization levels right in each of the plant load areas.

High voltage distribution eliminated tremendous quantities of heavy low-voltage conductor. Voltage drop was reduced. Flexibility was increased because later increases in power demand can be met by the simple addition of more load-center units without altering the over-all system.

Here's a typical example of the way General Electric engineers are helping industry meet today's demands for more power. For further information, contact your G-E sales representative, or write for Bulletins GEA-5600—"Power for Industry's Third and Biggest Expansion" and GEA-3592—"Load-center Unit Substations." *General Electric Co., Schenectady 5, N. Y.*



¼" x 6" bus previously needed to distribute power at 480 volts made this roof a veritable "copper mine." With new high-voltage distribution, buses were eliminated.

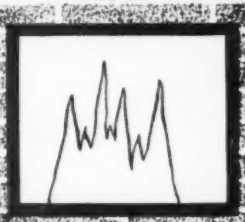


New metal-clad switchgear has adequate interrupting capacity. All breakers are rated 4160 volts, 1200 amperes, 250,000 kva. Completely metal enclosed, they provide greater protection for personnel.

GENERAL ELECTRIC

321-81

as fundamental as a chimney flue...

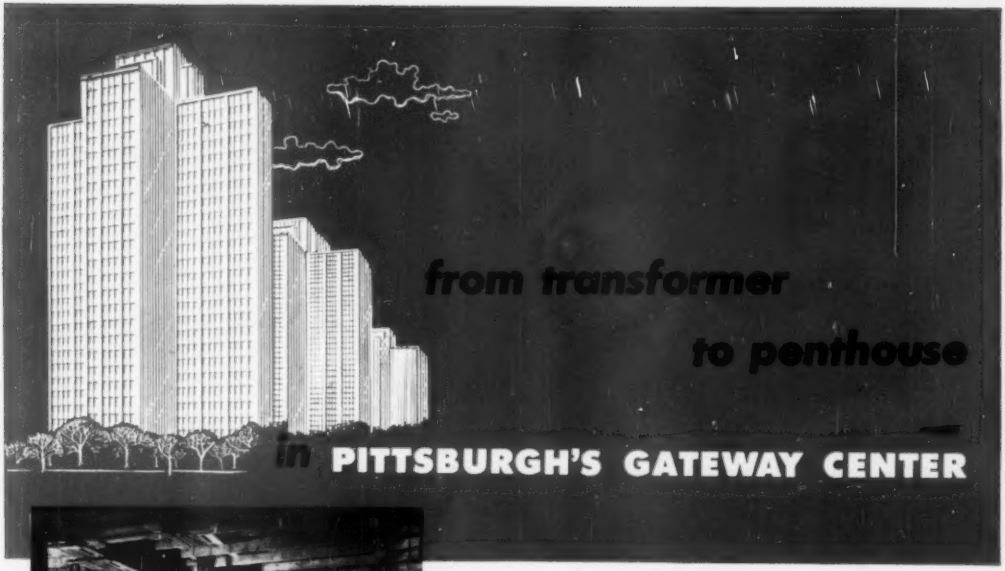


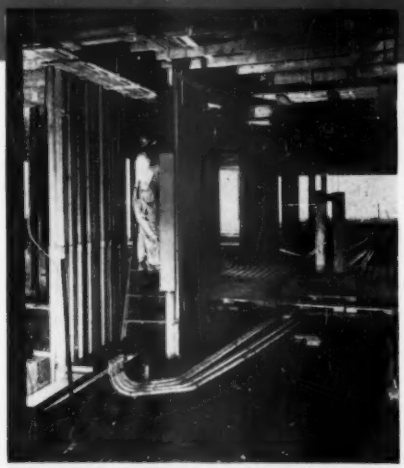
No electrical contract is really complete unless it contains raceways for telephone wires.

Just as the flue is needed to carry smoke and soot out of the house, telephone raceways are needed to carry telephone wires out of sight to pre-planned outlets.

A small item, but it protects the beauty of walls, adds to the convenience of the owner and means extra profits for you. You'll find it's good business to include telephone raceways and outlets in your house wiring contracts.

BELL TELEPHONE SYSTEM





IT'S SPANG CENTRAL CONDUIT

When construction is completed the three modern skyscrapers at Pittsburgh's Gateway Center will be equipped from top to bottom with Spang Central Conduit—a transformer to penthouse installation for power, light and communication.

Following closely on the erection of the structural framework, the main electrical arteries of Spang Cenlaco Conduit climb from floor to floor. As quickly as bays are completed, webs of Spang Central Black Conduit are laid to every outlet point.

The selection of Spang Central Conduit for these Pittsburgh office building landmarks is further recognition of Spang controlled quality conduit known and used everywhere because of its time-proved dependability and workability.

Wherever conduit is specified for commercial, industrial, or residential construction be sure to ask your distributor for Spang "Cenlaco", "Central Black", "Central White" and "Central EMT."

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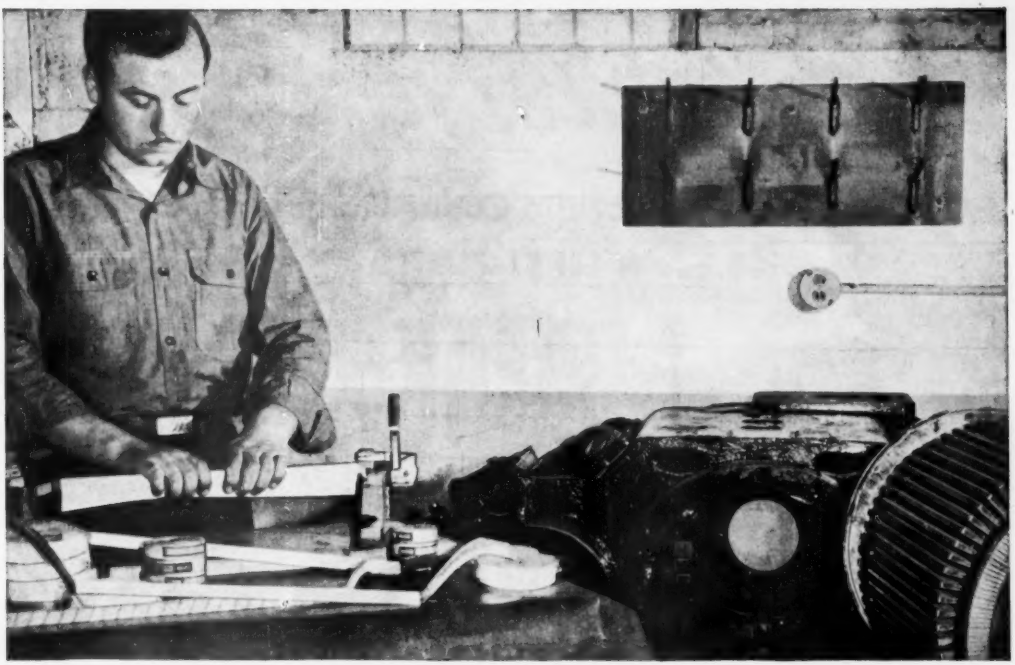

Everson Electric Co. counts on SILASTIC TAPE "...When insulation must stand up at 500° F"

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"The ability of Irvington's Silastic Tape to stand operating temperatures up to 500° F increases the life of our coils," says Everson, "and it saves space *too.*"

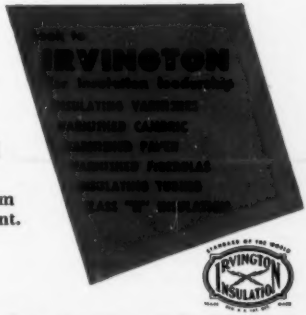
Here are some *other* reasons why so many leading manufacturers turn to Silastic Tape:

The combination of Fiberglas** cloth and Silastic rubber impregnation and coating gives high tensile strength and excellent chemical resistance, even at high temperatures.

After vulcanizing, Silastic Tape forms a solid insulation mass, free from voids or air pockets . . . moisture-proof, extremely abrasion-resistant.

Worth looking into, isn't it? Ask for the full story today!

*® Dow Corning **® Owens Corning Fiberglas Corp.



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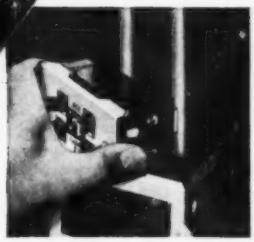
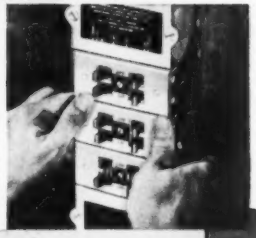
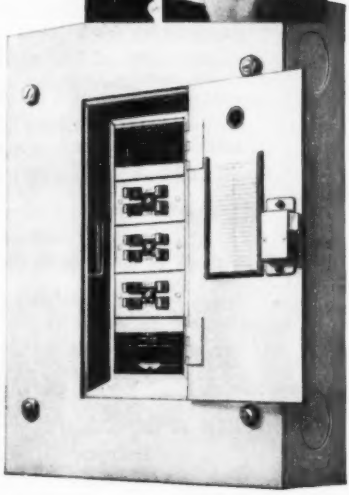


2 Assemble units to panel by "plugging in."

3 Wire them.



4 Plug them in place again.



Cutler-Hammer Type NMO Breakerpanels make it easy to "tailor" the circuit requirements of each job . . . either when the panel is first installed . . . or at any time later when the requirements of one or more of the circuits have changed. How is this done? It is very simple!! The Multi-Breaker unit serving each circuit just plugs into place. Where you want a 15 ampere breaker, you plug in a unit containing the exact number of 15 ampere single pole breakers required up to four. These units are available in 29 different circuit combinations making it possible to obtain the exact quantity and rating of branch circuits with a minimum of effort.

Cutler-Hammer Type NMO "Plug-In" Breakerpanels are now offered in sizes with from 8 to 42 single pole branch circuits in increments of 2. They are available in 120/240 Volts a.c., with 50, 100 and 200 ampere mains (lugs or circuit breaker) with 15, 20 and 30 ampere single and double-pole branch circuits; also, 40 and 50 ampere double-pole branch circuits. Multi-Breaker units are of the thermal-magnetic type that provide a lag on harmless overloads but instant trip on shorts.

Wiring these Type NMO Multi-Breaker units is also a cinch. You can wire them right in your hands before you plug them in . . . or you can simply swing them out for wiring as shown, using one of the positive-pressure contact jaws turning on the silvered bus bar as a hinge. And despite the small size of these Breakerpanels that better utilize wall and column space, you get much more gutter space (5½" in the 15" box) *with* more circuits. The narrow column type actually has *double* the number of circuits previously available in cabinets of similar height.

Beyond any doubt, this is the finest protection, the easiest to install, the most flexible, the most compact, and the most modern it is possible to obtain where a large number of branch circuits must be served, as in commercial and industrial buildings, hotels, schools, hospitals, large homes, etc. CUTLER-HAMMER, Inc., 1306 St. Paul Avenue, Milwaukee 1, Wis.

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Will Defense Production Be Caught in the Squeeze?

When Congress revised and extended the Defense Production Act, it relaxed a squeeze on business profits.

President Truman asserted that this action by Congress cripples the government in its effort to prevent inflation which, as he puts it, could lead to "enrichment and profiteering for the few, economic hardship and misery for the many."

He asked Congress to rescind its action.

This editorial—the second on problems presented by "escalator"clauses—aims to throw some light on this conflict of opinion.

The Squeeze

The squeeze on profits was imposed in the name of price stabilization. The idea behind it was simple. The *selling prices* of industrial products were to be held under a tight lid. But many industrial costs are affected by "escalator" clauses of one kind or another which tend to boost production *costs*. Thus, with rising costs and fixed prices, profits would be squeezed and much of the cost of defense would thereby be shifted from those favored by escalator clauses to business concerns.

The mechanics of this squeeze on profits were complicated. But here, in brief, is how it was to work. The first step was to require manufacturers to set ceiling prices, effective May 28, for their products.

These ceiling or maximum prices were to allow for increases in manufacturers' costs that had occurred since Korea. *But they did not allow for all increases.* Manufacturers, for example, could not include increases in indirect costs—office or selling costs. Neither could they, in calculating their new prices, include increases in the costs of materials or direct labor that had come after March 15. This was the first phase of the squeeze on profits.

The second phase was prepared by **not** putting a ceiling on costs. The Wage Stabilization Board said it could not disturb the operation of "escalator" clauses by which wage rates are geared to the cost of living. Moreover, nothing could be done to curb the operation of the farmers' "escalator" clause, the farm parity arrangement. Under it, the federal government underwrites higher prices for farm products to match increases in the cost of things farmers buy. So this left wages and many materials costs free to rise against a ceiling imposed on the prices of what industry has to sell.

Relief—at a Loss

On two conditions only would the Office of Price Stabilization permit a company to raise its prices and escape this squeeze. One of these was that increased costs had more than wiped out its profits; in other words, that it was operating at a loss. The other condition was

that the industry of which the company is a part was not, as a whole, making "excess profits." That is, the industry, as a whole, could not get price relief if its overall profits before taxes were greater than 85 percent of its average profits during the best three of the four years from 1946 through 1949. Many companies expected that their profits would be cut drastically before they could get through this narrow escape hatch.

When this squeeze on profits was set up, we were told that industry as a whole was reporting record profits. But, it was equally true that wage rates and farm prices also were at record high levels. And it was also true that, under the impact of rising taxes and the dislocations caused by the defense mobilization program, profits actually were on the way down.

Profits — Going Down

By the time Congress acted to relax the squeeze, corporate profits, after taxes, were running at a rate 20 percent lower than they had been six months before. And the clear prospect was that they would continue to decline.

So the issue put up to Congress was simply this. Should business firms stand so much of the brunt of the defense costs while "escalator" clauses continued to exempt organized workers and farmers from paying their share of those costs?

But this question actually is much broader than one of fairness or unfairness alone. One certain effect of such a squeeze on profits would be to undercut the capacity of private industry to install the new plants and equipment needed for our mobilization effort. Today —unlike World War II—private industry is financing almost all of our huge program to expand production. And about two-thirds of the money that has been plowed into the expansion and improvement of our industrial machine since World War II has come out of profits.

In view of all this, Congress decided last summer to relax the pressure on profits. This was done by the controversial Capehart Amendment to the Defense Production Act. This amendment has serious administrative weaknesses. But some measure with the same purpose is needed to maintain profits at a high enough level to finance the huge and continuing expansion of our industrial machine that is now underway.

Basic Issues

As soon as the amendment was enacted, the President asked Congress to revise the law again. The heart of his proposal was to restore to the Administration the powers it used last spring to arrange the squeeze on profits outlined here.

This controversy will continue. There can be no final answer to it as long as we have the economic controls made necessary by mobilization.

But if we look beneath the surface of this technically complicated controversy, we shall see clearly that the basic issues are:

1. Whether we really shall make an effort to distribute fairly the burdens of inflation caused by our defense mobilization—

2. Whether farmers and organized workers should be exempted from these sacrifices by escalator clauses—at the expense of the nation as a whole—

3. Whether profits should be squeezed still more—at the risk of putting a fatal squeeze on the effort of industry to build new plants and install new tools. These new facilities are essential to maintaining American living standards—and they are the heart of our ability to defend ourselves and the rest of the free world.

Americans face no more important economic issues at this time.

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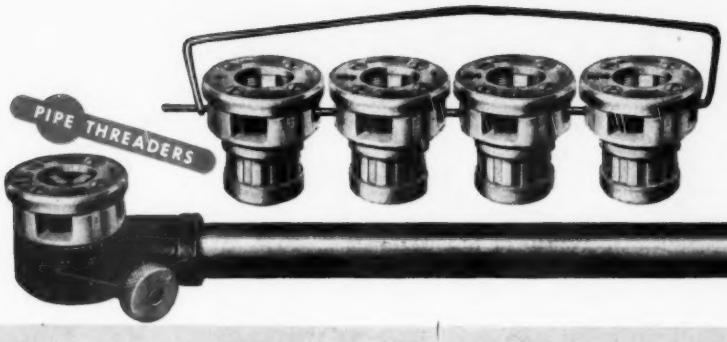

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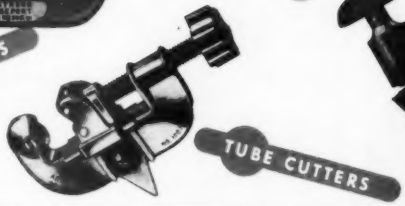

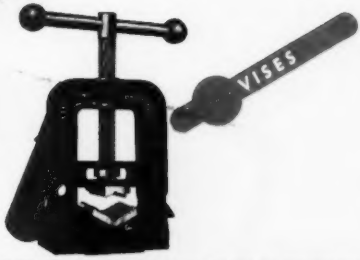

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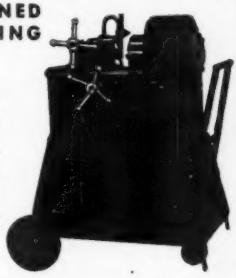

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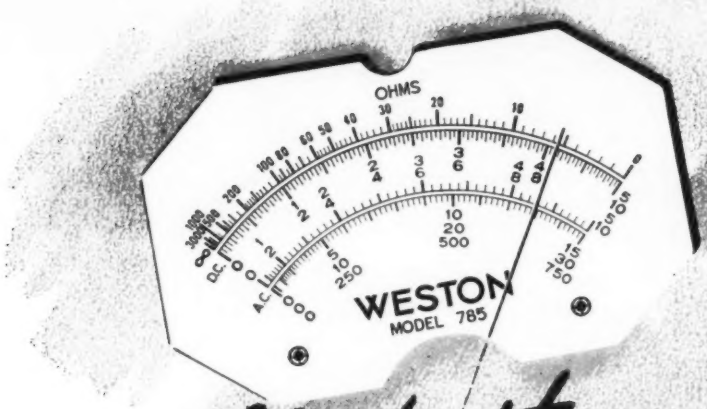

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Other features not available in testers of this type include: unlimited current measurements with the use of external transformers or shunts—voltage and current circuits completely isolated to provide greater flexibility and meter protection—potential and current connections can be made simultaneously. 'Phone your local WESTON Representative, or write—WESTON Electrical Instrument Corporation, 589 Frelinghuysen Avenue, Newark 5, New Jersey.

WESTON *Instruments*

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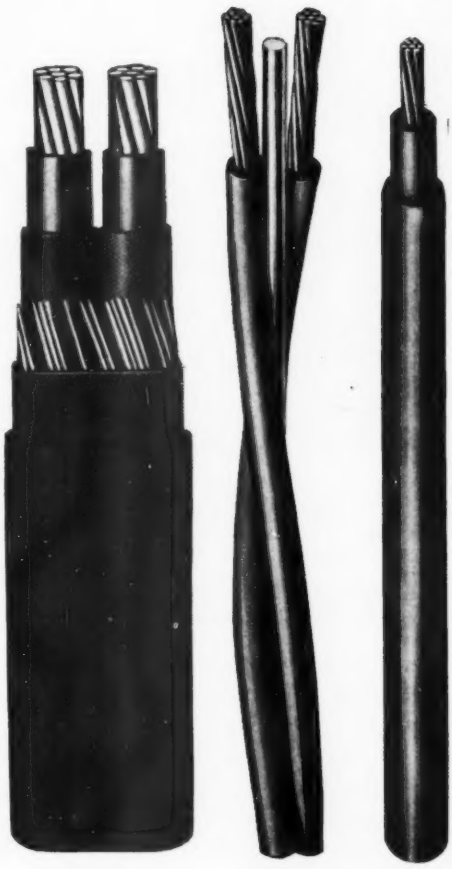

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Roebling makes a wide line of service entrance and service drop cables

SERVICE CABLES are an important part of Roebling's complete line of electrical wires and cables. Whatever your requirements for getting electrical energy from the utility's secondary to the meter, the right Roebling underground or overhead cable will give you the fullest measures of dependability...and economy.

All types and styles of Roebling Service Entrance Cable are made in the constructions best adapted for their own particular service range. From copper wires to protective jackets these cables are made entirely in Roebling plants where modern machines and methods assure highest, uniform quality.

A large part of Roebling's complete wire and cable line is required in today's rearmament program. You can count on the Roebling organization and distributors, however, to give you the best possible delivery service. John A. Roebling's Sons Company, Trenton 2, New Jersey.

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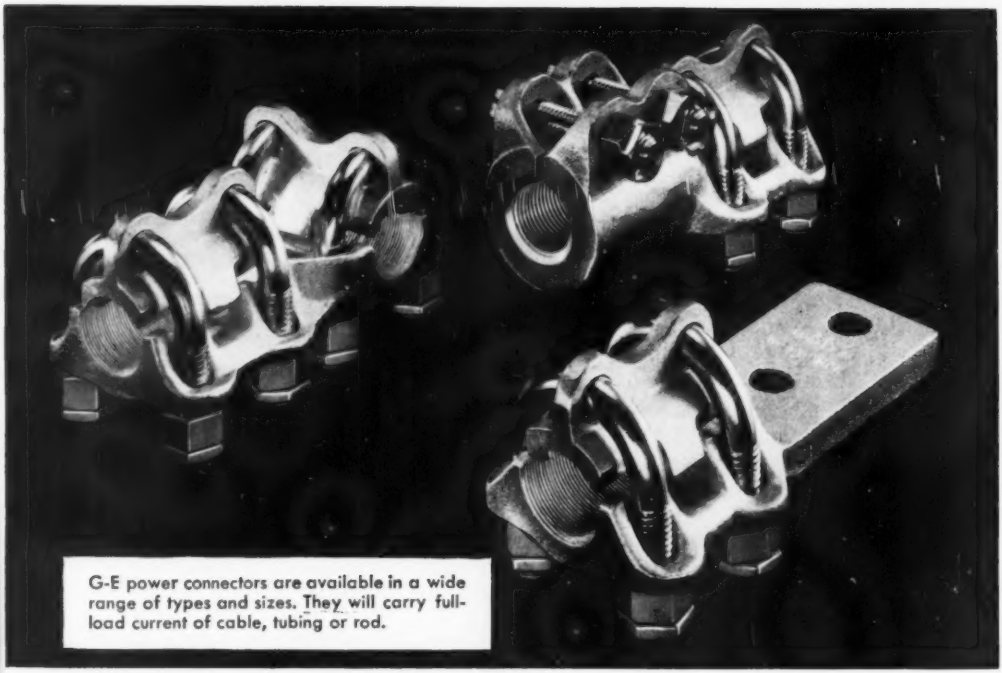

G-E power connectors are available in a wide range of types and sizes. They will carry full-load current of cable, tubing or rod.

Make power connections and forget 'em... when you use G-E Power Connectors!

With G-E power connectors, you get a permanent, high conductivity joint that resists vibration and maintains positive contact with the conductor at all times.

Low contact losses Silver on all current-carrying surfaces minimizes contact resistance—protects against formation of troublesome copper oxide. Interlocking sides confine cable strands within the enclosure, reducing inter-strand resistance. Carefully regulated copper content of connector alloy assures current-carrying ability equal to that of conductor. As a result, G-E connectors "run cool"—preventing oxidation through overheating.

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Types include straight, tee, block, angle, expansion, ground and many others. Why not place a trial order with your G-E sales representative today? Write for Bulletin GEC-400—it contains 44 pages of valuable connector information. General Electric Company, Schenectady 5, N. Y.

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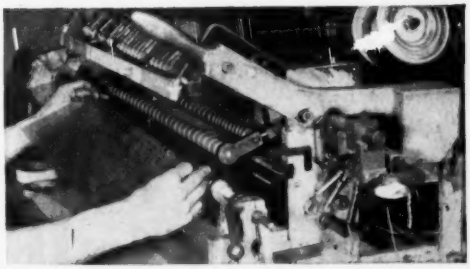
GENERAL ELECTRIC

STANCOR

TRANSFORMER COILS are Insulated with NATVAR Varnished Paper



Multiple Unit Coil winding at Standard Transformer Corporation. This operation requires uniform quality insulating materials. Uniformity of thickness and texture aid in meeting close space factors. Natvar varnished paper is used as interwinding insulation because of its high dielectric strength and flexibility. It conforms to the winding without "puckering," thus permitting a compact coil that will withstand even the severest requirements.

Transformers, reactors and related components manufactured by Standard Transformer Corporation, Chicago, have gained wide acceptance for all electronic applications. Their uniformity and durability in military and civilian applications are the result of sound engineering, careful workmanship and quality materials.

Natvar Varnished rope stock Paper is used as interwinding insulation "because of its high dielectric strength and flexibility."

Natvar Varnished Paper and other Natvar flexible insulations are available from conveniently located wholesalers' stocks or direct from our own.

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Natvar Products

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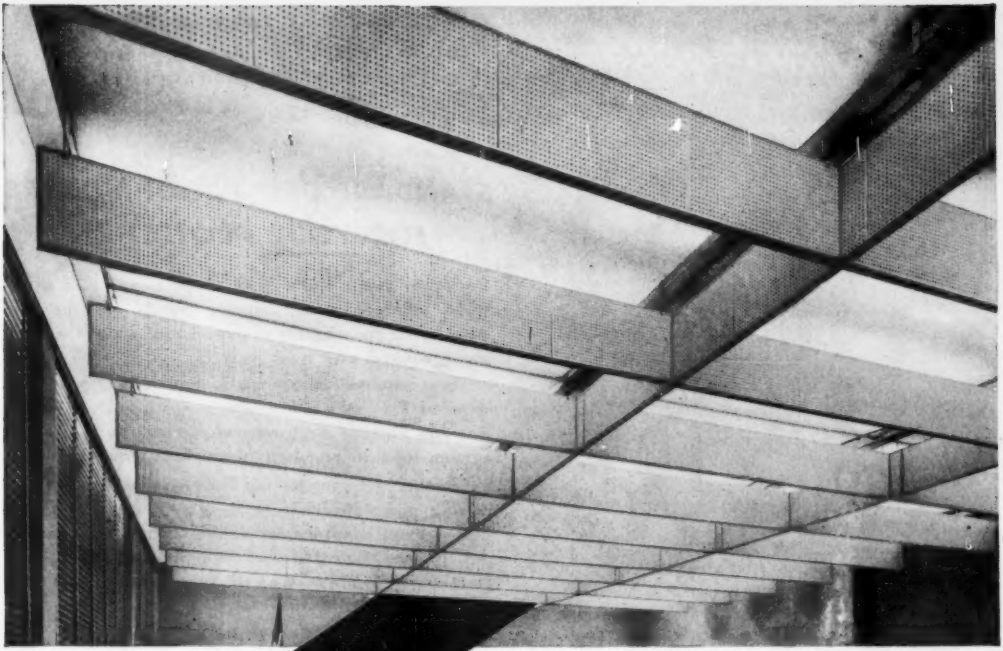

LIGHT

SOUND

controlled with one efficient system

CURTIS

LIGHT SOUND CONDITIONING

SYSTEM

The new Curtis Light and Sound Conditioning System offers an entirely new approach to LIGHTING and SOUND CONDITIONING problems. The system provides quality low-brightness illumination with acoustical treatment which eliminates excessive sound reflections and the annoyances and distractions which sound creates.

The Electrical System — Standard basic sections of the Underwriters' approved electrical portion of the Curtis System are supplied completely wired and packaged in 8" x 12" x 96" cartons. Each basic section covers a ceiling area of 256 square feet. Combining the basic sections with extension and wing sections makes it possible to provide quality low-brightness illumination and effective sound treatment.

The Sound System—The vertical baffles are constructed of highest quality acoustical material with a flame retarding, high reflectance washable finish. The baffles are positioned between the 8 foot, T-12, single pin fluorescent lamps to provide both recommended shielding and sound conditioning.

Yes, the Curtis Light and Sound Conditioning System offers the finest in lighting and sound conditioning efficiency from the stand point of low initial cost, low installation cost, low operating cost and low maintenance cost.

A comprehensive bulletin, completely illustrated, will be available soon. Write Dept.K12-05for your free copy.

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MOST Advantages for MOST Motor Applications

STANDARD DRIP-PROOF MOTORS FOR YOUR PROTECTION

Practically every motor needs protection—from flying chips, falling particles, dripping liquids, and the like. Also, by far the majority of motors used are of the polyphase, squirrel cage type.

These requirements are met to a unique degree by this series of Fairbanks-Morse motors—with built-in protection and superior electrical and mechanical design that account for their popularity throughout industry.

Whether your motor application problems involve driving pumps, machine tools, compressors, elevators, fans—or any of an infinite number of other applications—Fairbanks-Morse Standard Drip-proof Motors deserve your early investigation. Call your nearest Fairbanks-Morse Sales and Service center.

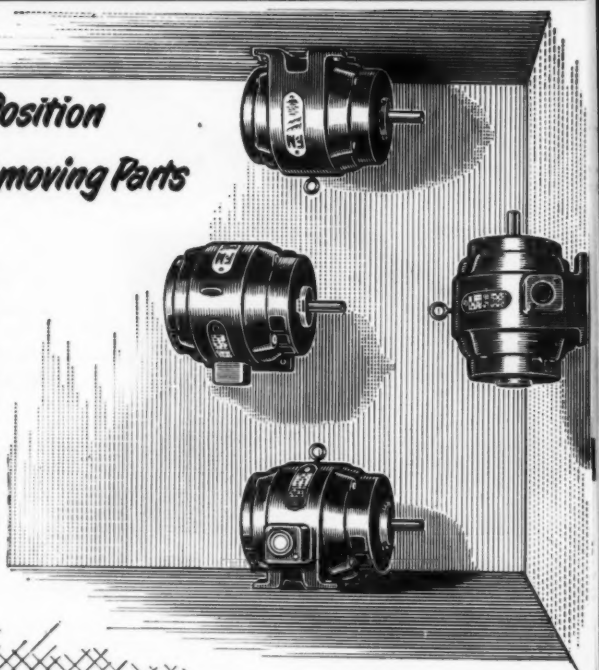
FAIRBANKS

A NAME WORTH

PROTECTION.. *in any Position*
SAFETY.. *no Exposed moving Parts*

Mount these motors anywhere—even on the ceiling or walls. Bearing arms have four bolts spaced 90° apart, enabling the bearing brackets to be adjusted to assure maximum protection. Motor can be mounted vertically without any changes in bearing construction.

There is complete safety for the operator. Fingers can even be placed in vents, for it is not possible to contact fans due to the protective shield. Smooth, streamlined external contour makes the motor easy to keep clean, easier to maintain.



Cross Flow Ventilation... Copper Spun Rotor

...OTHER UNIQUE FEATURES

Cross Flow Ventilation is an exclusive Fairbanks-Morse design that eliminates hot spots, prolongs the life of the stator installation.

Copperspun Rotor: a truly one-piece indestructible copper winding that withstands higher temperatures, has high electrical and thermal conductivity, better dynamic balance.

Rugged Frame Construction: Protection in any mounting position.

General purpose continuous duty: rated 40° C. and designed to carry 115% load continuously without injurious heating (1.15% service factor).

High efficiency, high power factor, good starting and accelerating torques.

Unique conduit box provides alternate assembly: either recessed, flush with frame or conventional external mounting.

Mounting dimensions conforming to NEMA standards.

Arrows show double flow of air that keeps motors running cool!

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when you need it!

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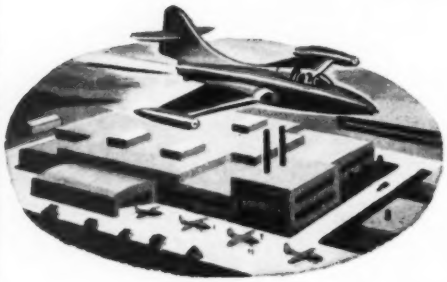
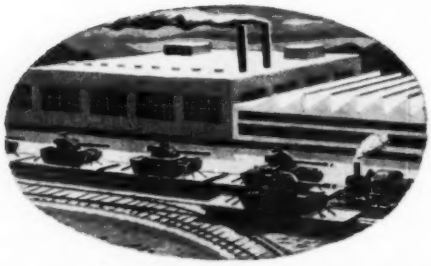


TRIANGLE produces a full line of quality WIRE, CABLE AND CONDUIT—products that will stand up under the most severe conditions—products that will not fail.



To be certain YOU get power when you need it—specify TRIANGLE.

Ask your electrical distributor. He knows—"It *Must* Be Right!"

THE TRADE-MARK OF TOP QUALITY!

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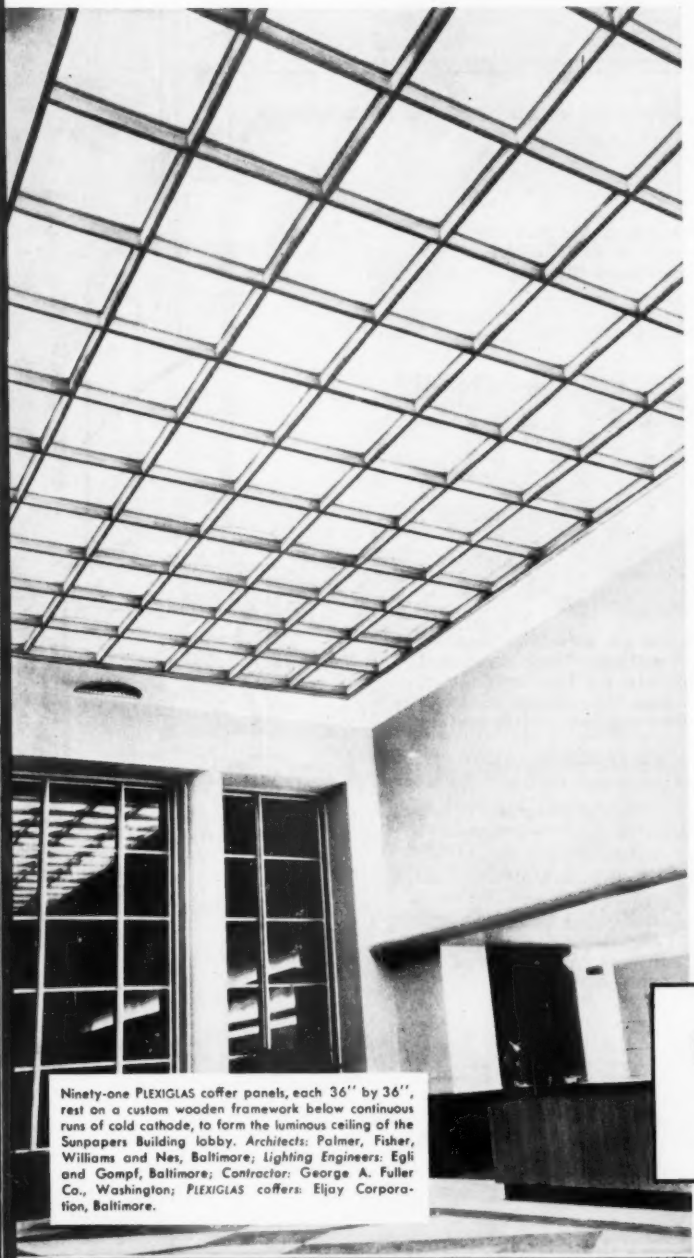
NEW BRUNSWICK, NEW JERSEY

IT *MUST* BE RIGHT

Glazon Building Wire • Glazon Non-Metallic Sheathed Cable • Armored Cable • Service Entrance, Service Drop, Varnished Cambric Braided or Leaded, Trioprene Trench, Power and Parkway Cables • Bare Wire • Rigid Conduit Hot-Dipped Galvanized • Electric Metallic Thin Wall Conduit • Flexible Steel Conduit

How a PLEXIGLAS Luminous Ceiling Solved a Design Problem



Ninety-one PLEXIGLAS coffer panels, each 36" by 36", rest on a custom wooden framework below continuous runs of cold cathode, to form the luminous ceiling of the Sunpapers Building lobby. *Architects:* Palmer, Fisher, Williams and Nes, Baltimore; *Lighting Engineers:* Egli and Gompf, Baltimore; *Contractor:* George A. Fuller Co., Washington; *PLEXIGLAS coffers:* Eljay Corporation, Baltimore.

Problem: To light this spacious, high-ceiling lobby of the new Sunpapers Building in Baltimore, and maintain its clean architectural design. Solution: A luminous ceiling of PLEXIGLAS acrylic plastic panels.

With PLEXIGLAS luminous ceilings, lighting becomes an architectural component, not a design afterthought. The white translucent diffusers — corrugated, flat, or formed into three-dimensional shapes—conceal lamps, ducts and pipes *completely*. Yet the output of the lighting source is utilized fully, due to high transmission efficiency. The luminous area overhead is the visible source of light—a lighting fixture as big as a room.

Other advantages: Complete, uniform diffusion; high illumination levels with low source brightness; control of brightness ratios; reduction of glare, shadows, and specular reflection to a minimum; the creation of a luminous environment. And the light weight and strength of PLEXIGLAS give freedom from breakage during installation and maintenance, and safety overhead in service.

Our new booklet—PLEXIGLAS LUMINOUS CEILINGS—outlines design considerations and presents case studies. Write for your copy today.

CHEMICALS FOR INDUSTRY

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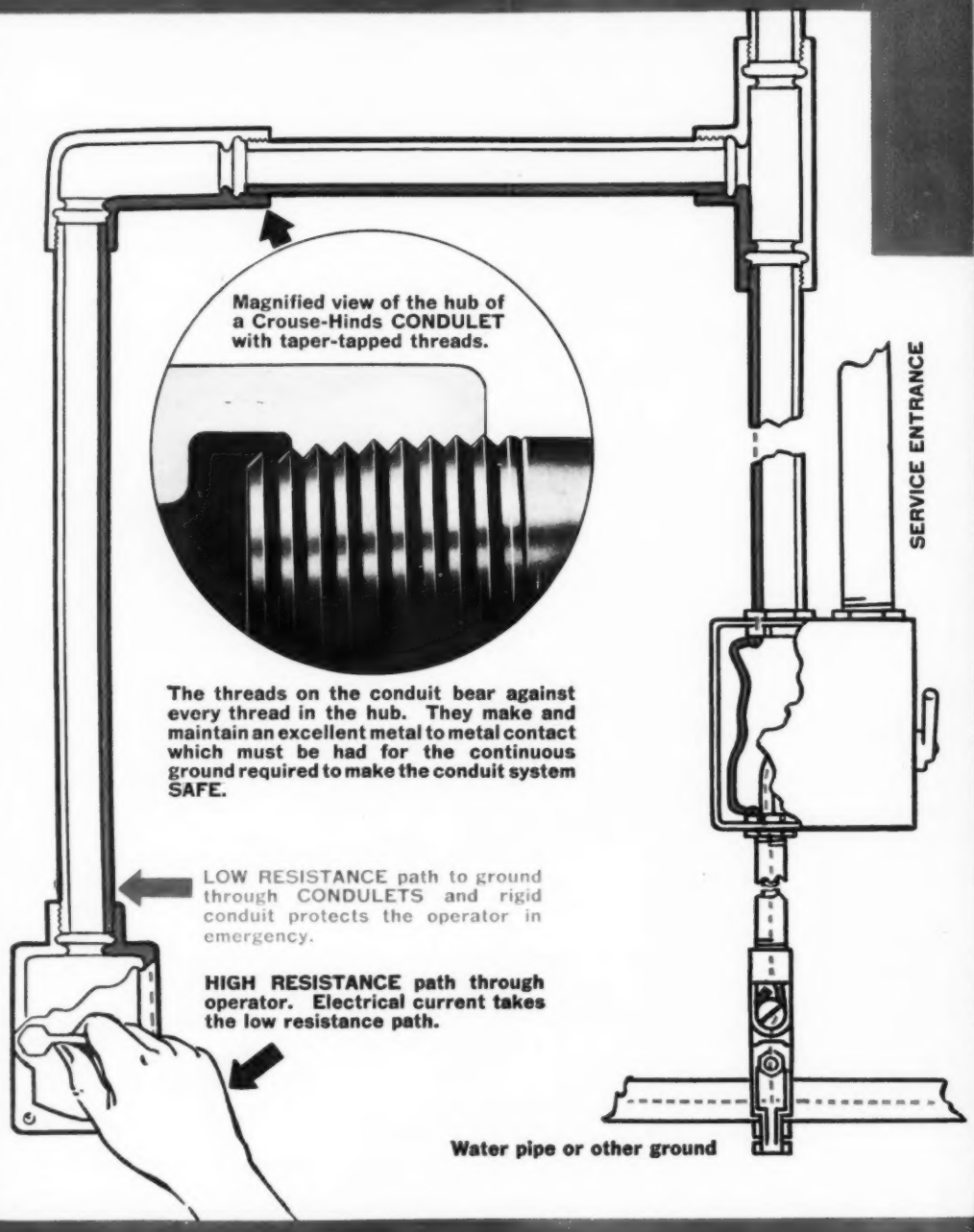
Canadian Distributor: Crystal Glass & Plastics, Ltd., 130 Queen's Quay at Jarvis Street, Toronto, Ontario, Canada.

CONDULETS* and rigid conduit


Magnified view of the hub of a Crouse-Hinds CONDULET with taper-tapped threads.
The threads on the conduit bear against every thread in the hub. They make and maintain an excellent metal to metal contact which must be had for the continuous ground required to make the conduit system SAFE.
LOW RESISTANCE path to ground through CONDULETS and rigid conduit protects the operator in emergency.
HIGH RESISTANCE path through operator. Electrical current takes the low resistance path.
SERVICE ENTRANCE
Water pipe or other ground

... the wiring method that gives you maximum SAFETY for workers AND property

Typical CONDULETS

Type T Obround Conduiet

Type LR Obround Conduiet

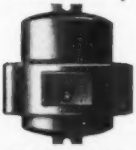
Type FS Conduiet

Type WMK Enclosed Safety Switch Conduiet

Type VC Vaportight Industrial Lighting Fixture

Type EVA Explosion-Proof Industrial Lighting Fixture

Type GUAC Explosion-Proof Junction Conduiet



Type EPC Explosion-Proof Line Starter

Type GCH Groundulet Safety Circuit Equipment

A low resistance grounding circuit is of vital importance in any electrical system. The combination of rigid conduit and CONDULETS provides the safest installation because this combination assures the permanence of the grounding circuit. In any grounding path, every joint that isn't tight in the beginning or loosens from vibration makes a high resistance point. Such high resistance creates a hazard for workers and can cause disastrous fires.

All rigid conduit has tapered threads and all CONDULETS (made only by Crouse-Hinds) have taper threaded hubs. This combination makes a secure joint that is tight in the beginning and stays tight. These joints will not loosen from vibration and assure a reliable and permanent low resistance path to ground. This SAFETY feature provides maximum protection against personal injury and fire.

Besides safety, a CONDULET installation gives you these additional definite advantages:

- **MECHANICAL PROTECTION.** Crouse-Hinds sturdy cast Feraloy CONDULETS and rigid conduit provide the best possible protection against accidental damage to the wiring and equipment. Prevents costly shutdowns.
- **FLEXIBILITY.** To meet all the diverse requirements of modern electrical layouts, CONDULETS are made in a wide variety of shapes and sizes with varied hub arrangements, including a full line of CONDULETS with detachable hub plates.
- **ECONOMY.** The installed cost of Crouse-Hinds CONDULETS and rigid conduit compares favorably with other wiring methods. The added advantages make it the really economical method that pays dividends over the years.
- **CORROSION RESISTING.** Cast Feraloy CONDULETS give the best protection wherever moisture, dust, or corrosive atmospheres are present.
- **UNIVERSAL APPLICATION.** You can install galvanized CONDULETS and galvanized rigid conduit under all atmospheric conditions and in all occupancies.
- **QUALITY.** The trademark CONDULET stands for the highest quality, reliability, and long life.
- **VARIETY.** More than 15,000 items are listed in the CONDULET Catalog, including a complete explosion-proof and dust-tight line for use in hazardous locations.

On YOUR next electrical layout, plan to get all the benefits of sturdy cast Feraloy CONDULETS and rigid conduit . . . the universal wiring method.

* *CONDULET is a coined word registered in the U. S. Patent Office. It designates a product made only by the Crouse-Hinds Company.*

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Thin caliper plus a combination of good mechanical and dielectric strengths. Recommended for use wherever plastic tape is practical.

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MORE THAN A QUARTER CENTURY OF TAPE SPECIALIZATION

Washington Report

A cease-fire in Korea in the near future is considered a real possibility by many Washington officials. But should the shooting stop, impact on mobilization would be minor, at least for several months. Rearmament is well under way—Congress has approved another $60-odd-billion in addition to $40-billion already committed—controls are deeply rooted, will carry through (under DPAct of 1950, amended) to mid-1952. And both Truman and Congress are convinced that national safety lies in military strength.

Military production will get a bigger bite of controlled materials in 1st-quarter 1952. Increase over October-December take will be: steel—408,000 tons; copper—80-million lbs; aluminum—80-million lbs. Military needs for these metals will continue to climb next year. Squeeze will go to consumer hard goods producers. But increases in steel and aluminum capacity will partially offset the pinch.

Electrical equipment manufacturers fared better in materials allocations for 1st-quarter '52 than many other industries, getting about the same quantities as for 4th-quarter '51. Their share: steel—586,710 tons; copper—147-million lbs; aluminum—24-million lbs.

Electrical conduit production must not be curtailed further because of its essentiality to electrical systems, the Electrical Conduit IAC told NPA at a recent meeting. The Committee also recommended the Government revise its specifications on hot-dip galvanizing to conserve zinc.

Electrical contractors now have representation in NPA in the recently formed Electrical Contractors IAC. First meeting was held October 10, in Washington, D. C. (See "In the News" Section for full report).

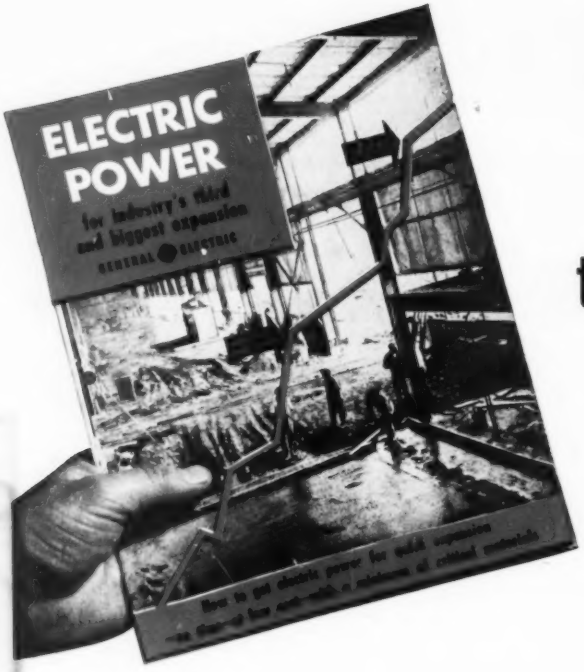
Electrical distributors now have an NPA order (M-86) to aid them in maintaining an inventory of copper wire mill products. It provides a replenishment period during 4th-quarter, for those with abnormally low inventories, and an X6 rating symbol, to replace stocks to meet anticipated ACM orders.

Minor capital improvements permissible under CMP Reg. 5 may soon be increased from $750 to $1000 per quarter. NPA now has this under study.

Industrial expansion and a rising volume of military construction have maintained total construction activity this year at record levels, in spite of a drop in private homebuilding. Predictions are for further increases next year—for AEC, direct military, metals production capacity expansion, defense supporting industrial facilities. Critical structural steel will be made available by continued tight restrictions on less essential construction.

Congress is asking for relaxation on school and hospital construction—DPAdministrator Fleischmann has agreed to review situation. Prospects are these projects will continue to be deferred, at least until mid-1952.

A $41-billion building construction backlog existed Aug. 31, 1951, according to "Engineering News Record" report. Continued NPA deferments of commercial and less urgent construction is shoving this backlog higher—now estimated at more than a three-year construction industry total.



Here's your guide to quick economical power expansion

Tells how to:

- Get more power for expanding production.
- Modernize old electric systems easily and economically.
- Save months in getting urgently needed electrical equipment.
- Cut equipment and installation costs.
- Conserve vital materials and manpower.
- Simplify planning, purchasing and engineering problems.
- Plan economically to provide for future growth.
- Guard against power shut-downs and lost production.
- Provide greater protection for your plant and safety for personnel.

Just off the press — a new booklet that tells how to plan your plant electrical system to meet today's need for more production — at low cost!

If you're planning for plant expansion—if you want more electric power to keep machines operating at top capacity—if you recognize the need for a more modern, more dependable electric power system—here's a booklet that may mean thousands of dollars to you in over-all equipment savings and lowered production costs.

It tells how hundreds of plants today are expanding and modernizing their electrical systems with the latest developments in G-E standardized "packaged" power distribution equipment.

It shows how you can cut corners in getting the equipment you need in the quickest time and with the least trouble. It demonstrates how you can often save through reduction of power losses—how you can plan effectively to meet future needs for years ahead.

This booklet is profusely illustrated with photographs of actual installations—some of them probably applicable to your plant. Send now for your copy—General Electric Company, Schenectady 5, N. Y.

Section B854-41
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Please send me a copy of bulletin GEA-5600, "Electric Power—for America's Third and Biggest Expansion."

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GENERAL ELECTRIC

NOVEMBER . . . . *at a Glance*

NECA in Washington

For those who attended, the fiftieth anniversary convention of NECA in Washington will be long remembered for its well planned and timely program and its stirring surroundings. The national monuments, the sense of history in the making, the feeling and often the fact that the fellow next to you at the mail desk or in the elevator was a cabinet member or a prominent senator were cherished experiences.

For those who couldn't go and for those who, though not members, are interested in the programs, activities and people of NECA we have sketched the highlights of the talks and discussions and pictured many of the delegates in our convention report beginning on page 53.

To Don Clayton, who took over the presidential gavel for the next two years, goes the great responsibility of leading a vitally important regiment of the electrical industry through the critical days ahead. He comes to his task with long experience in the industry and its problems and a distinguished record of activity in NECA affairs. We extend our best wishes for a most successful administration.

Price Control

Efforts to place the construction industry, with its fantastic complexity and variety of operations, under price control are not likely to be received with enthusiasm. But as this is written the step is being taken. At first review it looks as though a sincere effort has been made to produce an order with hope of effective administration and compliance. It is accompanied by a "trade guide" which spells out the order as it applies to trade practices without the legal tanglefoot. From the draft of the "trade guide" (believed to be substantially in its final form) we have reviewed some of the most important provisions this month in "How Price Curbs Will Work" beginning on page 67.

Sales Management

Probably no aspect of the electrical contractor's business activity takes more of a drubbing from both within and without the industry than his attitude toward selling. The difficult and exacting technology of the business seems to siphon off a lot of energy and planning which could be used more profitably in closer attention to sales management and sales methods. Ralph Johnson, vice president and general manager of Sturgeon Electric Co. in Denver, begins in this issue a series of two articles which take a very critical look at the problems. Here is a searching analysis of sales opportunities for an electrical contractor and a suggested method of budgeting out of current practical experience. "Sales Management for an Electrical Contracting Business" begins on page 64.

Precision Installation

Locating a new substation near the load center of an already-erected truck-motor assembly plant called for critical design and an exacting electrical installation. This assignment, which also called for the remote control of high-voltage switching, is discussed by Ralph C. Hodges, electrical engineer for the Wigton-Abbott Corporation, on page 74 under the title "Limited Space: An Engineering Challenge."

DATES AHEAD

National Electrical Manufacturers Association—Haddon Hall, Atlantic City, N. J., November 12-15.

Industrial Production Lighting Clinic—Sponsored by Chicago Association of Commerce and Industry, Chicago Lighting Institute, and Chicago Section IES, at Chicago Lighting Institute Auditorium, December 7.

Plant Maintenance Show—Convention Hall, Philadelphia, Pa., January 14-17, 1952.

American Institute of Electrical Engineers—Winter general meeting, Hotel Statler, New York, Jan. 21-25.

Southeastern Electrical Wholesalers Assn., Inc.—Second annual "Industry Day" meeting, Atlanta Biltmore Hotel, Atlanta, Ga., January 24-25.

National Electrical Manufacturers Association — Edgewater Beach Hotel, Chicago, Ill., March 10-13.

National Industrial Service Association—Annual convention, Stevens Hotel, Chicago, Ill., April 20-23.

Chamber of Commerce—Annual meeting, Washington, D. C., April 28-30.

4th International Lighting Exposition and Conference—Cleveland, Municipal Auditorium, Cleveland, Ohio, May 6-9.

National Association of Electrical Distributors—Annual convention, Atlantic City, N. J., June 9-13.

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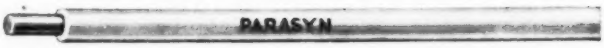

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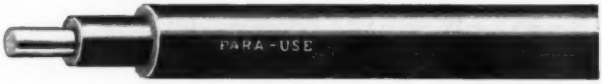

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ELECTRICAL CONSTRUCTION AND MAINTENANCE

51st Year—NOVEMBER • 1951

Aluminum Conductors

ANYBODY WHO HAS sat in on discussions of critical materials recently comes away convinced that the outlook for copper supply is dim to desperate. Not only for the moment either. Folks who ought to know are especially glum about the long haul. Use of copper for electrical purposes has been doubling each ten years, yet the best outlook for copper production is only a few per cent up in a like period.

THE ALTERNATIVES ARE TOUGH. Slow down the electrical industry to the pace of copper mining or find another conductor. There's aluminum. For ampere capacity per foot per dollar it is cheaper than copper. Conductor sizes are practical. The industry has experience with aluminum conductors in manufacturing and installation. It looks like in a year or so we can have all the aluminum we need. Why not just substitute aluminum for copper and forget our worries

IT ISN'T THAT EASY. Practically all of the engineering design of the electrical industry has grown up around copper as the conducting metal. The wires and cables, the raceways and enclosures, the dimensions of pull boxes, the methods of splicing and terminating, the mechanical materials in close contact have all evolved to suit copper. We learned long ago how to tin, solder, braze and silver joints and contact surfaces and to bring them together under pressure.

SET YOUR SLIDE RULE at the carrying capacity ratio and it's easy enough to figure wire sizes. But that is only the beginning. From there on it's a new technology. There are now available approved pressure connectors for the larger wire sizes. Inert gas welding has proved effective for joints and lugs. A special solder and flux is evidently quite successful on smaller sizes. But all of the methods so far available take special care in removing the oxide coating and preventing its reforming. This takes training and experience.

SOME ENTHUSIASTS for aluminum wiring have tried to assure us that the problems of oxide and electrolysis at connections and terminals are comparatively rare with proper workmanship. We hope they are right. But to ignore the problems could be dangerous and costly and it is the electrical contractor who ultimately carries the responsibility and financial risk for the satisfactory operation of the system.

BUT THE FACT REMAINS that aluminum is still the best practical substitute for copper as an electrical conductor. The electrical construction industry has installed and will continue to install aluminum conductors wherever they are practical, economical, and appropriate. It will take its share of development responsibility and grief as it always has.

THERE ARE SOME COMMERCIAL REASONS today and more in the future for the adoption of many forms of aluminum conductors in view of the growing copper shortage. Some encouragement from NPA by way of allocations for the purpose is desirable. But everyone will be a lot better off if the use of aluminum as an electrical conductor makes its way by orderly engineering development and commercial persuasion and not through the compulsion of mobilization controls.

William T. Stuart

Skilled Graybar personnel can often help you plan for savings of both time and money on important wiring contracts. For example, in the installation above, a special cable permitted a sharp increase in the current-carrying capacity of an existing – but inadequate – conduit system. Similar technical advice is readily available to you through a near-by Graybar office – as near, in fact, as your phone!

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Distributor of more than 100,000 different electrical items, Graybar offers you comprehensive service in meeting your requirements in the fields of lighting, communication, ventilation, and power supply.

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Graybar distributes a complete line of wiring materials through a nation-wide network of strategically-located offices and warehouses. Every item is a first-quality product of a leading manufacturer. You get the *fastest possible* service from a Graybar office that's always close at hand. When shortages exist, we will work with you and your customer to select practical alternate materials and arrange for realistic delivery schedules.

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LEFT TO RIGHT: NECA organizer Fred B. Adam, Saint Louis, Mo.; pioneering member Frederic W. Lord, New York City, and sole surviving founder James F. Burns, Schenectady, N. Y., were presented to the 1400 delegates . . . Election of vice presidents honored J. D. O'Connor, Sacramento, California, District 6; Charles Moseley, Charlotte, N. C., District 3; W. B. Schnorbus, Houston, Texas, District 5 and (sitting to the right of president Clayton) Alfred V. Bartlett, Sr., Providence, R. I., District 1, and Fred Oertli, St. Louis, Mo., District 7.

NECA Convention Report

Golden Anniversary meeting of National Electrical Contractors Association honors pioneers, tackles mobilization problems, hears congressional and administration views on defense contracting policies, discusses management-labor relations.

D. B. CLAYTON, Birmingham, Alabama, NECA's newly-elected president, accepted congratulations from retiring president E. C. Carlson, Youngstown, O.

THE general membership opening session meeting was called to order by A. Herrmann Wilson, president of the Washington (D.C.) Chapter. Mr. Wilson welcomed members and guests to Washington on behalf of the Washington Chapter and NECA headquarters office, located in Washington, noting the last Washington Annual Convention was in 1923. After complimenting Covention Committee Chairmen on the outstanding jobs done by each, he presented NECA President Erne C. Carlson, who in turn called to order and presided over the 50th meeting of NECA.

After roll call and approval of minutes President Carlson asked delegates to stand one minute in silence in memory of Edw. Vanderlinde, deceased NECA president whose term of office Mr. Carlson was appointed to complete following Mr. Vanderlinde's sudden passing last spring.

President Carlson next introduced Laurence W. Davis, who reported on his compilation of a history of the National Electrical Contractors Association, a 124-page book titled "NECA—Fifty Years of Progress —1901—1951". Commenting on this work, Mr. Davis stated that he found that the job of writing the history of NECA was one of writing the history of those individuals and members who have made NECA history. He then paid tribute in a colorful ceremony to three living Founder Members, all of whom were present, and presented each with a specially bound gold-embossed edition of the NECA "Fifty Years of Progress" book. These three Founder Members were: James F. Burns, Schenectady, N. Y.; Frederic W. Lord, N. Y.; and Fred B. Adams, St. Louis, Mo.

Mr. Davis next paid tribute in a similar ceremony to the five living past-presidents, all of whom were present. These were: Joseph A. Fowler, senior past-president (1925-27), Memphis, Tenn; Clyde L. Chamblin (1927-29), San Francisco, Calif; Leo E. Mayer (1929-35), Chicago, Ill; Robert W. McChesney (1939-49), Washington, D. C.; and Erne C. Carlson (partial 1949-51 term), Youngstown, Ohio.

President Carlson next paid tribute to E. H. Herzberg, Milwaukee, Wisc., by reading a resolution commending Mr. Herzberg for his work on the Apprenticeship Committee.

The Presidential Address was next delivered by Mr. Carlson. His subject was "Building for Defense is Your Business", which set as the Convention theme "Building for Defense". He reviewed the aims and objectives of the Association, its accomplishments, and defined its work as that of a national management-consultant service for small businesses, the businesses of electrical contractors. Thus NECA is not truly a "trade" association, he explained. He summarized the work of the Association under five programs: Educational and Training; Creative Selling; Labor Relations; Industry Representation to Government; and Service to Individual Contractors.

A report of the Secretary-Treasurer was next given by Clint J. Harder, followed by a report of the Executive Vice President, Paul M. Geary.

Final speaker on this opening session program was Dan W. Tracy,

LEFT TO RIGHT: Harry M. Schulman, A. S. Schulman Electric; W. Hultgren, Hultgren Electric; Leo E. Mayer, Hyland Electric Supply, and A. C. McWilliams, McWilliams Electric, all of Chicago. . . . Jack A. Scheffer, Kansas City Chapter, and Fred E. Geiss, Fred E. Geiss Electric, Kansas City, Mo. . . . H. C. Thompson, Anderson-Thompson Electric, and Hunter Hogue, Hunter Hogue Electric, both from Atlanta, Georgia. . . . H. A. Smith, Smith Electric, Spokane, Washington, with W. J. Varley, NECA San Francisco Chapter.

IBEW's International President. The key to the success of the relations between the Association and IBEW is "cooperation", he declared, using as his topic "The Labor-Management Team for Progress". Management and labor in the electrical construction industry has developed the attitude of seeing the problems of the other side, he said, and stressed that quick, clever "deals" are not tolerated—both are living together for the future, not on a year-to-year basis.

Mr. Tracy further discussed the pension plan, the Taft-Hartley Act, activities of other trade unions, and the need for planning now for the future, when building construction slackens. He warned against the Communist threat to our way of life, which we are fighting to defend, and urged increased efficiency and increased production as the most effective weapon against this threat. He also urged that we fight misleading Communist propaganda by providing better working conditions for our employees. He received an arousing ovation when he declared that IBEW will make no "deals" with general contractors.

Committee Reports

W. E. Frazer, District Vice President, Philadelphia, opened the Wednesday session. The meeting was devoted to reports of committees on Special Dues, Constitution, Governmental Affairs, Business Promotion, Research and Education. Action on these reports was scheduled for the business session on Friday. Robert M. Hatfield, Jr., vice chairman of the Munitions Board spoke in place of John D. Small, chairman of the Munitions Board, who had to appear before a Congressional committee as a witness on defense legislation.

Soviet Russia has increased its territory at the rate of 44 square miles an hour in the past 11 years, Mr. Hatfield said. This expansion of Russian power has been a prime consideration in America's efforts to build up its defenses, he added.

Discussing the effects of the huge mobilization program, Mr. Hatfield pointed out that government planning has been aimed at diminishing the necessity of building new production facilities by spreading contracts as widely as possible, making maximum use of plants and factories now in existence. On top of this, he added, a $5 billion capacity-expansion program has been launched to get the equipment we need when we need it.

He explained it is a Defense Department policy that subcontracting be encouraged and even required in order to spread defense orders as widely as possible. One of the most fertile fields for electrical contracting, he continued, exists in the modernization of military installations.

The report of the Special Dues Committee was presented by Don B. Clayton, Birmingham. This committee recommended that the basic dues be decreased from three-tenths of one percent to one-quarter of one percent of productive electrical labor payroll, and that the minimum dues be raised to $50 instead of $25.

In the absence of Harold A. Webster, chairman of the Constitution Committee, Clint J. Harder, secretary, made a brief statement regarding the work of this committee. He did not read the recommendations but said that mimeographed copies of the complete report were available and urged all members to study the various changes in detail and be ready to take action at the Friday morning session.

Governmental Affairs

The report of the Committee on Governmental Affairs was given by C. W. Moseley, Charlotte. The problems, he said, demanding attention fall into three principal categories—One, matters of an emergency nature having to do with material, price and wage controls; Two, matters concerning basic federal policies on construction procurement; and Three, federal policies on contracting procedure for federal work as a pattern for private work.

"A trade association is . . . the machinery for doing those things collectively which individual businessmen cannot do by themselves. It is an attempt, on the part of small businessmen, to cope with the preponderance of problems over which, as individuals, they can exert no effective control, but as members of a group, their bargaining position is enhanced . . . NECA has stepped out considerably in front of most trade associations in driving toward its objective of a service-type trade association."

E. C. Carlson
President,
National Electrical Contractors Association

Dennis J. Crimmins, New York City NECA Chapter; John Doris, John Doris Company; J. M. Watters, Lord Electric; all of New York, N. Y. . . . Harry M. Schulman, A. S. Schulman Electric, Chicago, with John N. St. Clair, Evans Electrical Construction, Kansas City, Mo. . . . A. J. Morroni, Electric Equipment and Engineering, Denver, with Simon Halle, Halle's Electric, Colorado Springs, Col. . . . Ed White, Edward J. White, Newark, N. J., and S. J. Cristiano, NECA Director of Labor Relations, Wyckoff, New Jersey.

The report noted that the trend of federal construction procurement is toward favoring the large integrated operator and use of the cost-plus-fixed fee contract. Mr. Moseley asserted that both practices were wasteful of manhours and dollars and he urged that a federal construction procurement policy be spelled out by the Congress which would utilize to the fullest extent possible, existing, competent equipped small business units in the construction industry and put as much of the work as possible on a lump sum contract basis. "Such a policy," he said, "should voice these principles:

"1. That full use be made of existing mechanical specialty contractor organizations having tools, equipment, technical and supervisory staffs who are now prepared to do the job, instead of allowing them to stand idle while inexperienced and inefficient high-cost organizations are developed.

"2. That job management functions and experience-tested industry practices be given full play and encouraged rather than suppressed or supplanted by arbitrary and unrealistic policies or procedures.

"3. That mechanical specialty contractors be assigned complete responsibility for the procurement of all equipment, material and labor required to accomplish their part of the project.

"4. That normal contracting procedures be followed to permit the awarding of mechanical specialty work to established organizations of experienced and proven capabilities."

To stop the unethical practice of chiseling on bids after firm offers have been submitted, the Committee urged a federal statutory contracting policy that would have the effect of making the awarding authority the depository of all bids from subcontractors.

Chairman H. L. Scott, Corpus Christi, in his report of the Business Promotion Committee, noted that industrial mobilization has blunted the normal development of the NECA business promotion program. His committee proposed activities for the coming year that would attempt to accomplish the following results in this order:

1—Improve the basic conditions in the electrical contracting industry upon which an effective business promotion could be built at the appropriate time. (To accomplish this a minimum allocation of $5,000 for educational purposes should be set aside for the coming year.)

2—Carry out defense-connected short-range programs designed to bring the contractor into essential maintenance operations. (For this purpose and for possible reprinting of the Preventive Maintenance Manual a budget of $2,000 was requested.)

3—Plan for long range promotional efforts so that the industry attitude can be properly conditioned and a program made ready at the appropriate time.

4—Continue the publication of the industry product literature manual.

Research and Education

Robert W. McChesney, Washington, chairman of the Research and Education Committee, reported that the NECA educational program designed to give contractor management personnel access to practical courses of instruction in management problems is now underway. Enrollments in both correspondence courses and in college and university curricula arranged through NECA have started. The first course is accounting. Four other courses will be available before June 1952.

"Our business has grown up to the point where there is not time to allow these younger men to learn only from experience," Mr. McChesney said. "They learn of engineering in our colleges and of installation techniques from our apprenticeship and training programs, and it also seems logical that we should provide them with related training in this business of electrical contracting".

The NECA education courses are already being offered in Drake University and Seattle University.

At the luncheon following the morn-

"It is only by spreading the work among as many small and medium size firms as possible that we can hope to assure all American business, not just a favored few companies, of their rightful place in our mobilization effort . . ."

"It is difficult for me to understand the motives which might prompt a large construction contractor to take upon himself the highly technical electrical work on a building when he could so easily and logically turn this phase of the job over to a skilled specialty electrical contractor."

John J. Sparkman
Chairman,
U. S. Senate Small Business Com.

LEFT TO RIGHT: Vernon Goedecke, Standard Electric; A. J. Thompson, Thompson Electric; D. W. Baker, Baker Electric, and Guy H. Davis, Davis Electric; all from Memphis, Tennessee. . . . Clarence Schives and Francis A. Bell, Gray Electric, Detroit, Michigan. . . . Horace Brown, Sachs Electric, East St. Louis, and A. Switzer, Switzer Electric, Baton Rouge. . . . G. A. Howarth, Utah-Idaho NECA Chapter manager, Salt Lake City; R. H. Taylor, Ace Electric, Portland, Oregon, and W. R. Grasle, W. R. Grasle Co., also of Portland.

ing session, Senator John J. Sparkman, chairman Small Business Committee, U. S. Senate spoke on "Small Business and the Construction Industry".

A far wider distribution of defense contracts among small businesses is necessary to prevent the forced shutdown of numerous small concerns, Senator Sparkman said. The percentage of defense contracts which have been funneled to small defense plants and businesses has fallen "far short" of absorbing their available capacity, he asserted.

A principal factor in the decline of small business participation, he explained, has been the pronounced change-over of the services from advertised to negotiated bidding. Under the competitive advertising procedure, smaller firms had been fairly successful in finding out what the government was buying, when it was being bought and through which procurement offices.

Senator Sparkman said his committee has urged that contracts should be negotiated only when a valid question of national security is involved or when the items to be purchased are so urgently needed that time is a vital factor. Otherwise, he added, maximum use should be made of open advertised bidding.

The senator cited the electrical contracting industry as being "typically small business."

Business Forum

The opportunity to speak one's mind on electrical construction industry problems drew a record atendance at the Thursday morning session. The open forum got under way with an encouraging spirit of give-and-take; ran the gamut from manpower problems to industry ethics; elicited healthy floor discussions and pertinent comments.

With the depletion of available local manpower supply, the industry now faces a critical shortage of skilled mechanics, S. J. Cristiano, New York City, told the group. Some employers are offering overtime work to get men. The net result is that some wage areas have gone from a 40-hour to a 48-hour and even a 60-hour week. A mere shift of manpower is not the answer, Cristiano warned. More mechanics are desperately needed. To solve this problem, Cristiano offered the following methods:

1. An accelerated apprenticeship training program which would be felt in the future.

2. Expansion of Local Union membership by taking in qualified, non-union mechanics to alleviate the present critical shortage. This device is viewed with unwarranted alarm by most Locals.

3. The use of "permit" or temporary workers which had considerable success during the last war. However, the past policy of bumping these men when a card man was available is subject to unfair labor practice charges under the T-H law.

4. Addition to labor agreements of a seniority provision which would give a measure of security to current Union members.

Cristiano revealed that a Senate Bill 1973, now before Congress, would eliminate the Union Shop election requirement of the T-H law in the Building and Construction Industry. This amendment is co-sponsored by Senator Taft and has a good chance of being adopted, according to reports.

To forestall possible rigid manpower controls by the Federal Government, Cristiano suggested that manpower problems be handled on an industry basis; urged NECA and the IBEW to jointly study this problem and formulate and establish an immediate and long-range manpower policy.

Floor discussion revealed a general agreement that IBEW Locals should expand their membership by taking in good non-union mechanics who would later become members. There was some

D. W. Tracy
President,
International Brotherhood of Electrical Workers

"The electrical contracting industry is at a high point of its development. None of us has any intention, however, of resting on our oars. We must recognize the great opportunities which are available for further improvement, growth and development, and we must be ready and open-minded to accept new ideas for future progress."

"We have learned that both labor and management do better for themselves when they seek mutual benefits rather than one-sided advantage. This spirit of cooperation in the electrical contracting industry has been the basis for our most important advances."

Ernest G. Kramm, North Carolina Chapter manager, and T. L. Rosenberg, electrical contractor; both from Oakland. . . . C. W. Moseley, R. H. Bouligny Company, Charlotte, N. C., with F. C. Michael, Mill and Marine Electric, Gastonia, N. C. . . . William C. Schlosser, Capital Electric, Madison, Wis. and H. H. Lundberg, Wadeford Electric, Chicago. . . . Rudy Viener, Jr., South Louisiana Chapter manager, New Orleans; George A. Seaman, manager of the Southwestern Line Constructors, Fort Worth, Texas, and L. E. Chick, City Electric, Dallas.

disagreement about the advisability of adding a seniority provision to labor agreements on the basis that such a measure would tend to stifle initiative and reduce efficiency of the workman.

Lack of interest on part of the contractor, economic pressure on the purchaser of contractor's services, and the escalator clause were blamed by F. E. Keith, Des Moines, Iowa, for the growth of installation (labor only) contracts in the electrical construction industry. This type of contract probably will never be eliminated, he believes, so long as the electrical contractor fails to do a real selling job on the customer to convince him that there is no over-all economy in this type of operation. In the interim, contractors will have to live with it. Keith pointed out the fallacy of using a common overhead markup on this type of contract; revealed that overhead on labor is much more than on material supplied for the job. Be fair about markup on material and you will be able to sell your customer a complete job, he advised. Keith sees present conditions as offering an excellent opportunity to draw customers away from the labor-only type of contract. Comments from the floor indicated that proper markup on labor is important and that application of handling charges on materials furnished by others can—and is being—sold to customers.

Why do electrical contractors continue to bid jobs below cost? To snare a job and then make a profit on extras. To keep an organization together. To keep a fellow contractor from getting the job (malicious intent). Contractors who continue this practice are gamblers, pure and simple, and a liability to the industry, stated K. D. White of Atlanta, Georgia. An intelligent bid can be made only on the basis of an accurate estimate and judgment based on past experience. White urged all contractors to take refresher courses offered by the NECA educational program; suggested members create business by applying their knowledge and experience to particular customer problems; noted that our industry's best asset is the confidence of the customer in the ability, fairness and integrity of the electrical contractor.

Electrical contractors all over the United States are signing contracts that take away every legal thing to which they are entitled, warned E. J. White, Newark, N. J. By comparing a humorous edition of a contract with the clauses of a legal contract, White pointed up such pitfalls as the stipulation that the contractor be responsible for all errors and omissions of the architect and engineer on plans and specifications; the fact that owners are not responsible for payment of subcontractors by the general contractor; unfair interpretations of disputed points and numerous other vicious clauses. White compared the 15% withholding of payment to an axe held over the contractor to accede to unfair demands and urged NECA to bring these evils to the attention of its members through an educational program. He suggested that NECA also prepare a sample contract that is mutually protective to *all* parties concerned. Such a model contract could be distributed through the American Institute of Architects and the National Society of Professional Engineers for their adoption, he concluded.

Code of Ethics

Can the Electrical Construction Industry have a Code of Ethics? Robert L. Wilkinson, Spokane, Washington, firmly believes such a Code can and should be developed. Self-regulation by an industry is entirely legitimate and legal, provided such regulation is on a voluntary basis, he stated. Wilkinson deplored the fact that NECA can act against members who fail to pay dues, but can do nothing against contractors who operate unethically. To prove that something can be done in this respect, he revealed that the In-

"Basic industrial expansion to support our great military output is under way. We know that housing and institutions for workers and their families are as necessary as factory buildings. It is certain that basic standards of living must be maintained if productivity is to continue to improve. Electrical equipment has become a part of that basic living standard. Some times this equipment is taken for granted today by almost every one. . . . as you gentlemen know, many electrical appliances help release women for factory employment or community service when manpower or women power is in great demand."

R. M. Hatfield, Jr.
Vice Chairman
Munitions Board, Dept. of Defense

LEFT TO RIGHT: J. R. Williams, Lord Electric, Pittsburgh; R. J. Etherson, New York NECA Chapter, Huntington, N. Y.; J. J. Ferry, Ferry Electric, Pittsburgh. . . . L. T. Souder, electrical contractor, Washington; Jack J. Reilly, Walker Brothers of Conshohoken, Washington; J. F. Mackessy, Hebbard and Mackessy, Washington. . . . Carl S. Menger, Triangle Conduit and Cable, New Brunswick, N. J.; Jacob Ross, General Electrical Shop, electrical contractors of Ann Arbor, Michigan; G. H. Lineberry, Westinghouse Electric, Philadelphia; Don Droll, Detroit.

land Chapter, NECA, at Spokane developed its own Code of Ethics patterned after the best features of similar Codes in other industries (National Association of Real Estate Boards has one of most successful Codes in existence).

All clauses of the Code were carefully studied and approved by all Chapter members and its operation is strictly on a voluntary basis, Wilkinson reported. Violators are subject to judgment by a jury of members and are reprimanded, if guilty. Any contractor guilty of three violations can, upon a vote of the membership, be expelled from the Chapter.

The Inland Chapter Code was freely publicized among the general contractors and consulting engineers in the area. Since its operation, petty antagonism among electrical contractors has been reduced and bid peddling is on the wane, according to Wilkinson. He knows it is working on a local basis and feels that something along these lines can and should be done on a national basis.

A well-attended, helpful clinic on general accounting, estimating and job cost analysis was conducted Thursday afternoon by E. R. Cornish and Frank Groleau of the Research and Education Committee. Emphasizing the fact that all costs, indirect as well as direct, must be included in estimates if jobs are to finally yield a profit, the co-chairmen discussed NECA's new accounting course, developed specifically for the electrical contracting industry.

Realizing that only a small minority of electrical contracting firms have persons in charge of accounting with sufficient training to independently undertake the installation of a new accounting system, the course was developed as a basic guide in accounting fundamentals, refinement of office procedures and management of business financing.

Using material from the course to illustrate recommended applications, Cornish and Groleau analysed fixed assets, job costs, receipts and disbursements, payroll summaries, job expenses, weekly progress reports and material cost distribution.

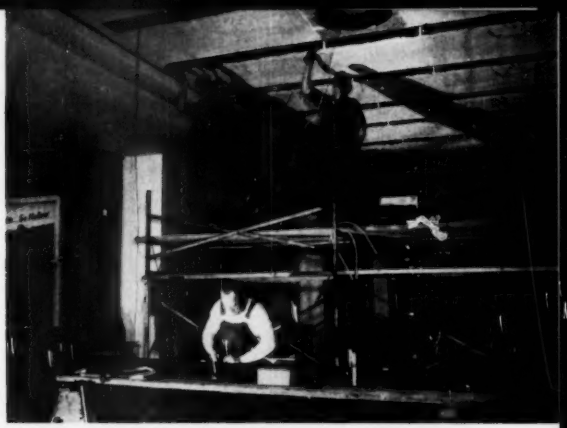
At the Friday morning session it was resolved that the Administrative Committee be instructed to study the desirability and possibility of establishing a building fund having the ultimate objective of acquiring a building to serve as NECA's national headquarters. This study is to be prepared and presented for action at the next annual meeting of the Association's general membership. Two purposes prompted this proposal; to increase the prestige and stability of the Association, and to provide a desirable investment.

Another important resolution pertained to a campaign to enroll a thousand new members during the coming year.

Elected to succeed E. C. Carlson as NECA president for the 1951-'52 term was D. B. Clayton of Birmingham, Alabama, former v. p. of District 3. Other changes in the administrative picture were the elections of Charles Moseley of Charlotte, N. C., to succeed Clayton as District 3 v. p.; W. B. Schnorbus, Houston, Texas, to succeed J. L. McClure of Dallas as v. p. of District 5, and Fred J. Oertli of St. Louis to succeed S. C. Dodson of Omaha as v. p. for District 7. Re-elected to vice presidential offices were Alfred V. Bartlett, Sr., Providence, R. I. District 1, and J. D. O'Conner, Sacramento, California, District 6. W. Edward Frazer of Philadelphia, v. p. for District 2; Oliver F. Burnett, Jr., of Chicago, v. p. for District 4, and Ralph E. Johnson of Denver, v. p. for District 8, whose terms continue, complete the vice-presidential ranks for the coming year.

W. I. Colson, manager, Rhode Island and Southeast Massachusetts NECA Chapter, Providence, R. I., and Joseph A. Libbon, secretary, Electrical Contractors Association of Greater Boston. . . . R. C. Dean and Paul Engebretson, General Electric, Chicago. . . . F. M. O'Neill, Washington and H. B. Frazer, Jr., H. B. Frazer, Philadelphia. . . . Henry J. Tierney, field representative, Eastern Region, NECA, Hamden, Connecticut.

FIXTURES ARE ASSEMBLED in 15-foot sections (three units). Troughs are mounted end-to-end. Ballasts, lampholders end-plates and brackets are added. Long troughs are then carried to the next specialized group, . . .



SCAFFOLD CREWS who install them. Mechanic at bench makes lamp circuit connections and flexible conduit jumpers; hands completed unit to men on scaffold, who install trough in ceiling opening and make connections.

It's Quicker With Teamwork

Specialized crews of Commonwealth Electric Company operated as a team to install 3,000 fluorescent fixtures in St. Paul office building.

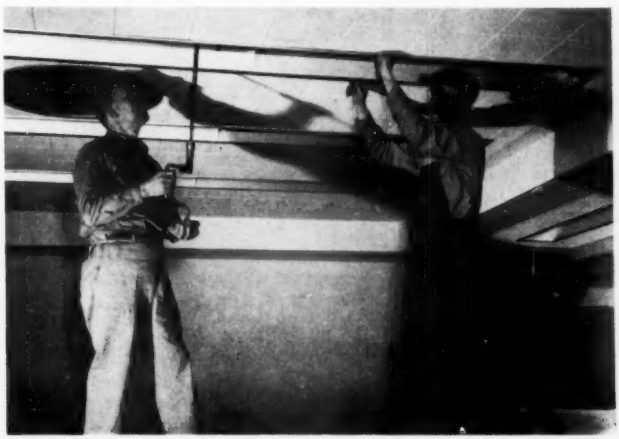
WHEN Commonwealth Electric Company, electrical contractors of St. Paul, Minn., installed the complete electrical system for an addition to the St. Paul Fire and Marine Insurance Company office building, they faced the problem of mounting some 3,000 Curtis "Eye-Comfort" fluorescent troffer units on the various floors.

The fixtures were installed in 15-foot sections flush in a suspended ceiling and spaced on four-foot centers. Each five-foot unit (12-inches deep) houses the ballast, a 60-watt, low-brightness, instant-start lamp, and has a deep Alzak aluminum reflector. When completed, the over-all lighting system provided a maintained intensity of better than 50 footcandles.

Branch circuit control is by means of 15-ampere circuit breakers (four, 15-foot fixture sections per circuit) in flush wall distribution cabinets. Each of the five floors in the building has three sets of lighting risers, generally one riser per panel. Thus, should one of the risers fail, only one-third of the floor area is affected.

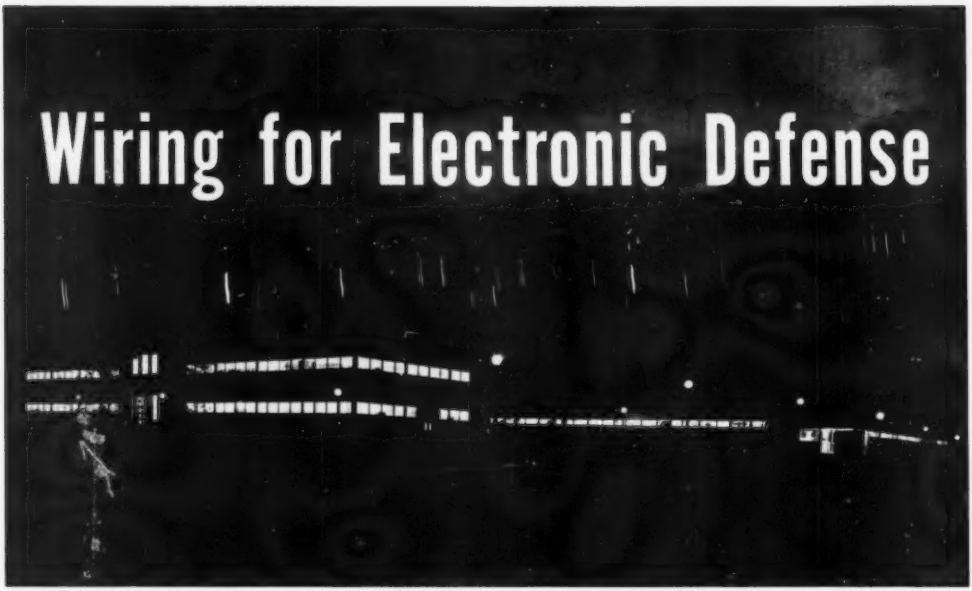
To accelerate fixture installation so the company could hasten transfer of its various departments into the new building, Commonwealth engineer George Miller and general foreman Henry M. Rudiger adapted a sequence operation technique with specialized crews. The photographs show how it was done.

FIXTURES AS THEY look after installation of acoustical tile on ceiling. They are now ready for . . .



REFLECTOR CREW to install Alzak aluminum reflector sections. Note extension screw driver on hand brace. The completed troffer units were installed by the team with appreciable savings in time.

Wiring for Electronic Defense



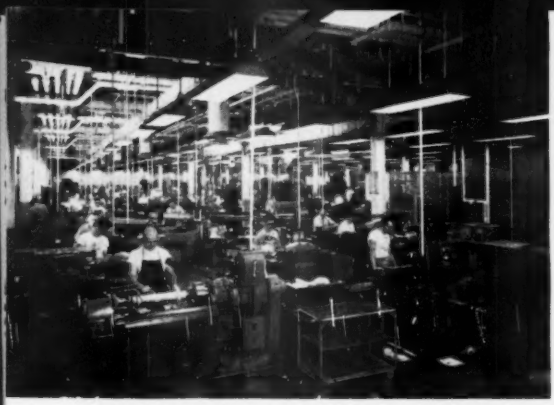
THERMOPANE VISION STRIPS around office and manufacturing buildings, street lights and warning beacons on boiler stack distinguish Western Electric plant at night. Vision strips can be blacked out if necessity dictates; permitting round-the-clock operation of the electronics production plant without providing external illumination.

Multiple utility services, high-voltage distribution, wide selection of utilization voltages, load-center sub-stations with banked secondary busways, interlocked selector switches, planned lighting and controlled air conditioning are important design features in Western Electric's modern plant in Allentown, Pennsylvania.

By I. M. McNair
Electrical Engineer
Western Electric Co.

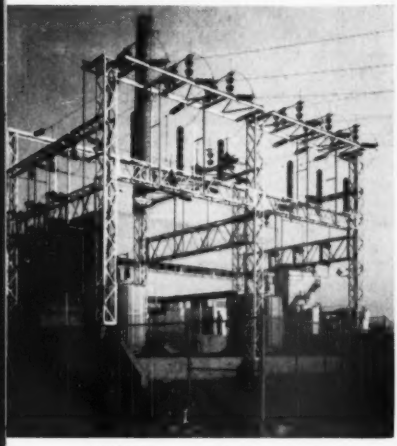
MORE than 5,000 pieces of production equipment, served by a system of 120/208-volt plug-in busducts, are installed in Western Electric's modern Allentown plant to produce a wide range of vacuum tubes, varistors, thermistors, resistors and component parts for a host of intricate electronic devices. This varied electrical load is augmented by such heavy equipment as 2,300-volt 800 hp. refrigeration compressors and 440-volt pumps, as well as considerable testing facilities, resulting in the demand for a multi-voltage ac distribution system. Add to this the necessity for exact standards of cleanliness and closely-regulated atmospheric conditions, as well as the need for high-grade lighting for critical seeing tasks, and the design problem becomes a challenge; a challenge answered competently by the engineering departments of Western Electric and the Austin Company, and by the construction ability of the H. P. Foley Company, electrical contractors.

Primary power is via three incoming overhead utility lines; two at 66-kv and the third (for emergency use only) at 12.47-kv. The higher voltage lines are cross connected at primary level through a 66-kv bus equipped with transfer switch which can be closed only when one of the key-interlocked air-break switches on the two incoming service lines is opened. This permits both transformers to operate from either one of the 66-kv lines. Connections from this cross-connecting bus to two 5,000-kva 66/12-kv delta/grounded-wye transformers are through stick-operated fused disconnecting devices having fuse interrupting capacities of a million kva. Specially-designed fuse elements provide transformer protection and are graded with low-side circuit breakers. Transformers are equipped with primary taps for 67,650-, 66,000-, 64,350-, 62,700- and 61,050-volts to insure satisfactory matching of service voltage with load requirements. Secondary voltage is 12,470; the same as that delivered to the plan over the emergency service line. Except for critical testing equipment, which has built-in voltage regulators, the voltage control on the 66-kv system is satisfactory without additional plant control.



FLUORESCENT LIGHTING fixtures are mounted on continuous channels, so spaced that additional units can be interspersed if higher illumination is warranted. Power connections are dropped from overhead busways or carried up through the floor.

ENGINEERING division, located on second floor of administration building, is evenly illuminated by fluorescent fixtures recessed into an acoustical ceiling. Air conditioning system maintains atmospheric purity.



POWER is supplied through outdoor transformer equipped with double winding 5000-kva 66/12.47-kv units having four full-capacity taps.

METAL-CLAD SWITCHGEAR in the manufacturing building consists of seven 12470-208/120-volt load-center substations. Distribution is by plug-in busduct.

DISTRIBUTION of power, compressed air, gas, hydrogen, steam and water through pipe network, is accurately followed by distinctive color-coding.

Located adjacent to the outdoor 66-kv transformers is a unit type metal clad outdoor switching center, containing a 12.47-kv bus, all necessary service metering equipment, transformers for 115/230-volt single-phase auxiliary power, a normally-closed dummy breaker in the 2-section bus structure, and vertical-lift draw-out type oil circuit breakers in the three incoming service lines and four outgoing plant-utilization feeders.

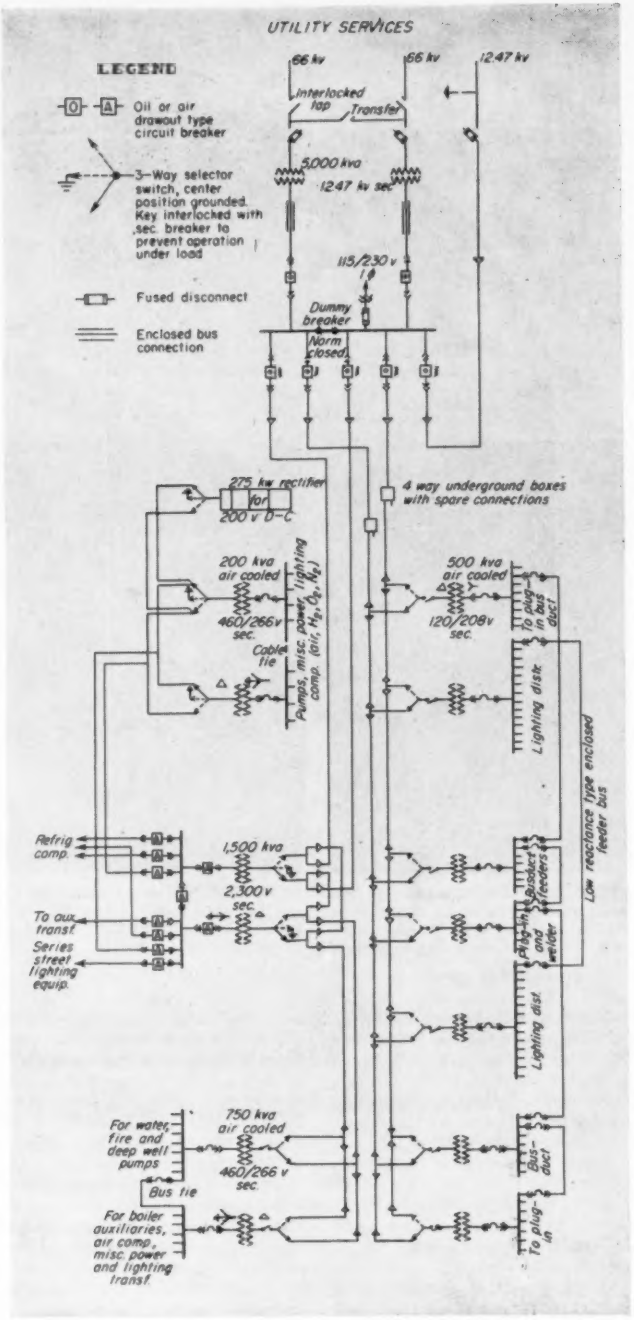
Unlike the transfer switch tie in the 66-kv bus (normally open), the interlocked dummy breaker in the 12.47-kv bus is normally closed. It can be opened only when all oil breakers connected to one side of the split bus are already open.

For restricted emergency service, the interlocked breaker in the 12.47-kv. incoming feeder can be closed after both 66/12-kv. transformer OCBs are open.

The outdoor substation also contains two 1,500-kva 12,470-2400 volt transformers and associated switch-gear, including two series street lighting transformers. This part of the substation supplies directly three 2300-volt 800-hp freon compressors and a 275-kv rectifier for oxygen and hydrogen generation.

To minimize voltage drop and to increase efficiency, high voltage feeders are carried direct to local load center substations and to the high voltage equipment. Main feeders into the plant from the two outdoor switching centers are carried underground through 4-inch fiber conduits, sheathed in concrete. Where conduit lies beneath floors, a layer of red concrete is placed to warn against drilling into the duct line when installing machinery, etc. The 2300-volt lines to the gas house are 5-kv parkway cables buried directly in the ground.

All transformers are delta-wye, with secondary neutrals solidly grounded. And all transformers are served from multiple feeders through selector switches, key-interlocked to prevent operation under load. Multiple feeders are tapped to opposite sides of the split 12-kv main bus through oil vertical-lift drawout-type circuit breakers. Depending upon location, function and level of controlled voltages, selector switches are either liquid or



DISTRIBUTION SYSTEM includes numerous voltage levels, banked secondary busduct installation, automatic protective equipment and transfer facilities to bypass temporary faults or segregate sections of the system being altered, expanded or serviced. System was designed with liberal surplus capacity for maximum flexibility in power application.

air-insulated, and are either two-position, or 3-position with center taps grounded.

Utilization voltages are maintained as high as feasible from an overall economic and efficiency viewpoint. For example: the 800-hp. refrigeration compressors, and the series street-lighting equipment is operated at 2300-volts, while 460/266-volt circuits carry power directly to boiler auxiliaries, fire and deep-well pumps and compressors for air, hydrogen and oxygen.

To power 20 parallel runs of 1000- and 600-amp 3-phase 4-wire 250-volt plug-in bus duct, one 2000-amp welder circuit and 21 general lighting feeders, a series of seven 500-kva air-cooled transformers are utilized; transformers having primary taps for 12.6-, 12.3-, 12.0-, 11.7- and 11.4 kv., with 120/208-volt secondaries. Provision is made for the ultimate installation of three additional units.

The 120/208-volt installation is a banked secondary system, with low-reactance type enclosed feeder bus used to tie substation secondary busses together. The feeder bus tie between the two lighting distribution units was initially rated at 1000-amps, (now listed at 1350-amps) connected through 1000-amp air circuit breakers, while ties between power units are via 2500-amp feeders (now listed at 3000-amps) and 1600-amp breakers.

System Has Multiple Advantage

The system results in security; for multiple utility service lines, interlocked transfer switches and circuit breakers, dual feeders and banked secondaries insure service continuity, while, for indoor units, non-inflammable transformers and switchgear encased in grounded metal safeguards the operating and maintenance crews. The system also results in economy; for high-voltage distribution to load centers and short branch runs effect important savings in copper. It results in flexibility; for shifting loads can be handled without altering the basic distribution plan. And it results in efficiency; for adequate feeder capacity and the judicious use of capacitors maintains voltage drop below 3% and load factors in the 90s.

Plug-in bus ducts, together with branch conduits and piping for other utilities, are carried along the ceiling of the ground floor, with extensions either dropped in rigid conduit to feed ground-floor machines, or carried upwards through the hardwood flooring to serve second floor equipment.

By concentrating all power distribution and other services overhead in

the ground floor area, the problem of establishing connections to the more than 5000 pieces of production equipment throughout the two-story plant has been greatly simplified. This applies to all utilities, as well as to electrical. For more than 40 miles of piping are installed to distribute hot and cold soft water, cold city water, steam, condensate return, high- and low-pressure air, city gas, hydrogen, nitrogen and oxygen. Distribution of these electric, gas and liquid services under the floor, rather than overhead, enhances the appearance of the second-floor production areas and eliminates a gathering place for dust that would be injurious to the electronic products made in the plant. It also effects a saving of pipe length required for connections, and permits rearrangment of equipment without inconveniencing employees engaged in production.

Color-Coded Utility Grid

The pattern formed by busducts, branch electrical lines and utility piping is a geometric plaid-appearing design, dividing the manufacturing floor into small areas; an arrangement permitting a connection to be dropped through the floor at any point and not be farther than 10 feet away from a complete set of services. Duct, conduit and piping are distinctively colored for positive identification, making connections fast, safe and sure.

Illumination throughout the manufacturing areas is supplied by deep 3-lamp 40-watt fluorescent troffers mounted on continuous channels on 12-foot centers. Initial footcandle readings, before equipment was positioned, averaged over 65. With equipment and operating personnel in the area, levels are sustained between 45 and 50 footcandles. Local lighting in the form of adjustable incandescent and fluorescent fixtures augments this general level for all critical operations,

Regulated Air-Conditioning

Since the plant was especially planned to meet the needs of manufacturing electronic products, where the slightest trace of perspiration on the hands of the 2500 employees or small particles of dust might seriously impair the quality of the electronics equipment, the air conditioning system was designed to maintain almost clinical standards of cleanliness.

To achieve this, ten air conditioning units are located in the truss space over the second floor and four on the lower floor to process over ¾-million cubic feet of air per minute, and almost four miles of ducts and more than 500 diffusers and automatic dampers to vary the relative amounts of air are installed to evenly distribute this processed air. Pressures are also carefully regulated, with indoor pressure slightly greater than outside so as to prevent unfiltered air from entering the plant through doorways, and with slightly negative pressures maintained in chemical treating and spray rooms to prevent fume-laden exhausts from recirculating to other areas.

Part of the job of atmospheric control is performed by the building itself, for brick and concrete walls and roof incorporate fiber and foam glass insulation and vapor seals, and continuous glass vision strips around the main building consists of double-walled sealed window glass. Separating the roof from the second floor ceiling is an 11-foot open truss space housing air conditioning equipment, containing branch electrical circuits, and serving as a plenum chamber for air to be recirculated to the main floor.

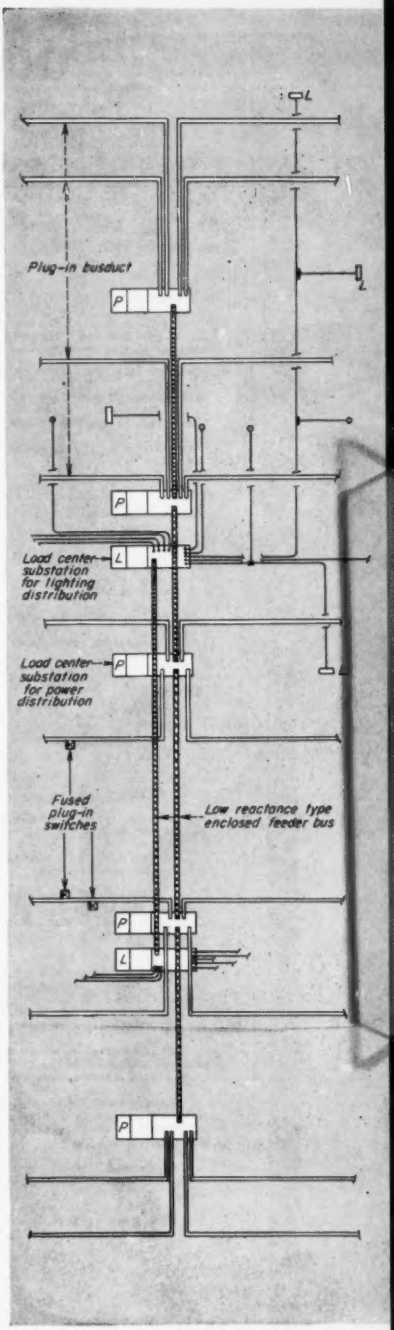
The amount of air taken into the building is determined by the amount of process exhaust to be replaced, the amount needed to maintain the positive indoor pressure, and the condition of the outdoor air. All air taken into the building passes through dry type filters.

800 Horsepower Compressors

All air used for cooling the building is chilled by water; the water being chilled in a utility building at the rate of 3720 gallons per minute by three synchronous 800-hp freon turbo compressors, 3 evaporators and 3 condensers. The installation is rated at 2310 tons of ice per day.

As is true with the manufacturing building itself, the electrical system, air conditioning plan and comprehensive network of other utility services are tailor-made to meet the exacting needs of this modern electronics plant in Allentown.

In addition to the two 375-by-400-foot manufacturing floors, the Allentown plant includes an administration building, gas generating plant, induced draft cooling tower and various utility buildings. Offices, laboratories, drafting rooms, recreation rooms, manufacturing areas, medical and first aid stations, cafeteria, lobby and areas for personnel services are all comprehensively equipped with electrical equipment and appliances. Situated on an attractively-landscaped 50-acre tract, the buildings are a study in clean, sharp lines of modern design, a design resting firmly on a modern, flexible electrical distribution system.

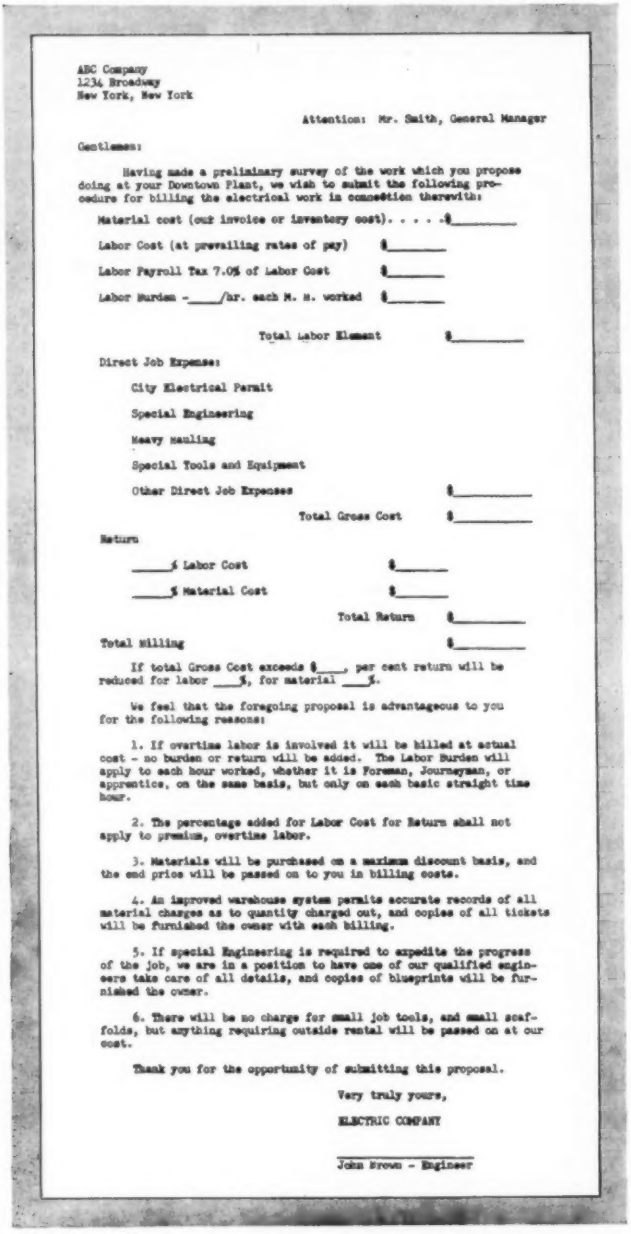

Plug-in busduct
Load center substation for lighting distribution
Load center substation for power distribution
Fused plug-in switches
Low reactance type enclosed feeder bus

LOW REACTANCE type enclosed feeder busses provide cross connections between the five power and two lighting load-centers. Plug-in busways distribute power to all sections.

Sales Management for an

By Ralph E. Johnson

Vice President and General Manager
Sturgeon Electric Company, Inc.,
Denver, Colorado



ABC Company
1234 Broadway
New York, New York

Attention: Mr. Smith, General Manager

Gentlemen:

Having made a preliminary survey of the work which you propose doing at your Downtown Plant, we wish to submit the following procedure for billing the electrical work in connection therewith:

Material cost (our invoice or inventory cost). . . . .$_____

Labor Cost (at prevailing rates of pay) $_____

Labor Payroll Tax 7.0% of Labor Cost $_____

Labor Burden -____/hr. each M. H. worked $_____

Total Labor Element $_____

Direct Job Expenses:

City Electrical Permit

Special Engineering

Heavy Hauling

Special Tools and Equipment

Other Direct Job Expenses $_____

Total Gross Cost $_____

Return

_____% Labor Cost $_____

_____% Material Cost $_____

Total Return $_____

Total Billing $_____

If total Gross Cost exceeds $____, per cent return will be reduced for labor ____%, for material ____%.

We feel that the foregoing proposal is advantageous to you for the following reasons:

1. If overtime labor is involved it will be billed at actual cost - no burden or return will be added. The Labor Burden will apply to each hour worked, whether it is Foreman, Journeyman, or apprentice, on the same basis, but only on each basic straight time hour.

2. The percentage added for Labor Cost for Return shall not apply to premium, overtime labor.

3. Materials will be purchased on a maximum discount basis, and the end price will be passed on to you in billing costs.

4. An improved warehouse system permits accurate records of all material charges as to quantity charged out, and copies of all tickets will be furnished the owner with each billing.

5. If special Engineering is required to expedite the progress of the job, we are in a position to have one of our qualified engineers take care of all details, and copies of blueprints will be furnished the owner.

6. There will be no charge for small job tools, and small scaffolds, but anything requiring outside rental will be passed on at our cost.

Thank you for the opportunity of submitting this proposal.

Very truly yours,

ELECTRIC COMPANY

John Brown - Engineer

FIG. 1—Typical proposal for cost-plus construction work. Sales points are listed at end of letter.

EVERY electrical contractor has a definite potential market for his services within the area in which he operates. Whether this potential is limited or limitless; whether his scope of operations is narrow or broad depends to a large extent upon the individual contractor, upon his analysis of his own business and his development of a market. Whether, in effect, he is willing to devote some time and energy to sales management.

The first consideration in evaluating the sales possibilities in any business is to outline the functions of that business, then to carefully analyze the potential of each function. For an *electrical contracting business*, the principal functions with which a sales management executive is concerned can be listed as follows:

1. Sales Departments
   a. Construction
   b. Service
   c. Lighting
   d. Motor Shop—including Power Equipment
   e. Appliance Sales and Service
   f. Residential Wiring
2. Public Relations
3. Advertising
4. Market Research
5. Pricing

Each of the main subdivisions of the business is set up as a department and treated as a separate accounting entity. Public Relations, Advertising, Market Research and Pricing are the sales tools which management uses in carrying out the sales program for each department.

The electrical contracting business is so broad in its economic aspects that it is most essential to departmentalize its activities, although all of them dovetail very closely in actual operation. Because of the competitive nature of the various types of activity, each requires separate treatment of its pricing structure. Provisions must be made for departmentalized accounting control. In the following discussion, each listed function will be considered separately.

Electrical Contracting Business

PART 1 —A searching analysis of sales opportunities for an electrical contractor and a suggested method of budgeting for various phases of an overall operation

Since the majority of jobs which are contracted for in our industry are done under the lump sum contract, the opportunities in this field lie in being competitive with the ability to prosecute the work on a profitable basis through efficient management. There has been—and probably will always be—a great opportunity in the field of remodeling and reconstruction on a cost-plus, and time-and-material basis. The principal factor involved in sales of this nature is price. By submitting an intelligent proposal which is economically sound for the Contractor, and presents desirable features for the Owner, it is possible to sell cost-plus work on a profitable basis against unscrupulous competition.

Considerable organization is required in order to handle cost-plus work accurately. From a job management standpoint, it is much more difficult to provide the men in the field with accurate layouts, bills of material and to keep the job stocked with the proper material at the right time. More frequent trips to the job are necessary for material delivery than are required on a contract job. Material charges and pricing are much more involved.

All of the cost factors prevail in cost-plus work that are apparent in contract work, and in some respects —more. Therefore, the only difference in pricing this should be found in the return which goes to the contractor. This difference may be resolved in the lack of risk in one as against the other.

In order to make an intelligent proposal for a cost-plus installation, it is first necessary to make a preliminary appraisal of the work to be done. Then, with the information at hand, make as accurate an overall estimate as possible. This estimate, together with information relative to the duration of the job, provides a basis upon which the return will be based. Then a proposal similar to that illustrated in Fig. 1 can be made to the customer. Note the addition of "selling points" at the end of the proposal—the six conditions which prove advantageous to the customer.

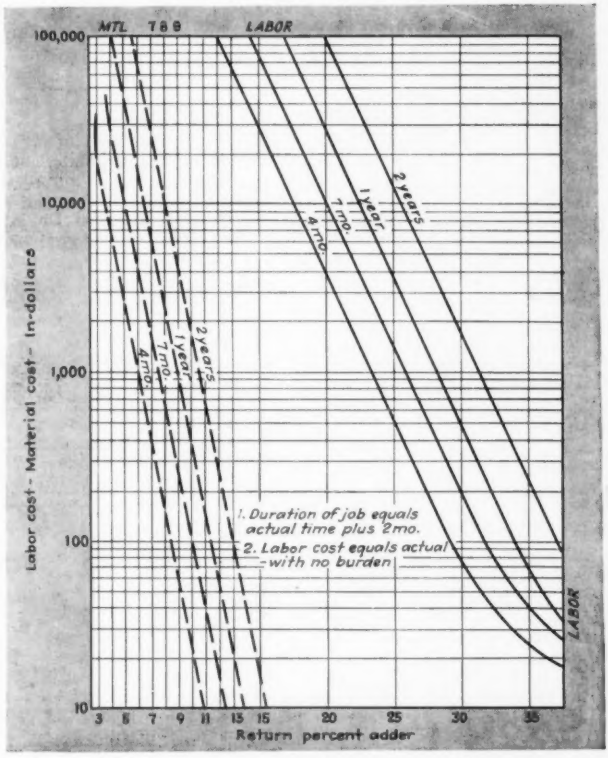


FIG. 2—Rate of return curve is used to determine return to be added to material and labor cost items on cost-plus work.

The Labor Burden rate per hour indicated in the proposal is determined according to the procedure outlined in Fig. 3 and is established according to the operating conditions for each business.

The Rate of Return is established by the curve shown in Fig. 2, using the preliminary estimate of work and the anticipated job duration time as determining factors.

It is the function of the Service Department to perform small installation work efficiently and with dispatch. Considerable organization is required to manage this type of business, and it is impossible to function without proper personnel and facilities. It would appear at the outset that sending out fully equipped trucks to do jobs rather than to transport men and material would be simpler and easier to administer. Actually, the facts prove that it is far more costly and involves a much greater capital investment in personnel, equipment and material.

Much more administrative personnel

OVERHEAD BUDGET: (For ensuing year)

Dues	$224.85
Depreciation	129.36
General Expense	148.79
Interest	198.75
Insurance—Misc	145.37
—PL & PD	44.52
Office Expense	287.90
Rent	858.84
Supervision	10,767.47
Gen. Taxes	167.17
Telephone	157.26
Tools—Exp	98.87
Travel & Ent	102.58
Total O. H. Costs	$13,331.73

In order to maintain a Labor Burden Rate of 0.90¢ per hour, it would be necessary to work during the ensuing year a total man-hours of:

$$\frac{13{,}331}{.90} = 14{,}812 \text{ Hours}$$

This represents a total of 7 men working 40 hours per week.

If the labor rate was $2.00 per hour the total labor cost would be:

$$14{,}812 \times \$2.00 = \$29{,}624$$

The percent labor cost of total sales averages 32%.

On this basis the total sales would be:

$$\frac{29{,}624}{.32} = \$92{,}570$$

Of this amount material represents 38% or $35,176.60.

Also, Job Expense represents 4.0% or $3,702.80.

Therefore the budget would set up as follows:

Material Cost	$35,176.60
Labor Cost	29,624.00
Job Expense	3,702.80
Prime Cost	$68,503.40
Overhead	13,331.73
	$81,835.13
Anticipated Profit	10,734.87
Anticipated Sales	$92,570.00

Therefore, in order for this business to operate successfully, it is necessary for the Contractor to maintain an average of 7 men working 40 hours per week on work which would be priced as follows:

Labor Charges:

Basic Rate	$2.00
Payroll Taxes—7%	.14
Burden	.90
Contractors Cost	$3.04
Margin 16.6% of Basic	.33
	$3.37/Hour
Probable Selling Price	$3.40/Hour

Material Charges:

Material Cost (Each item sold)	$_____
Plus 16.6% Margin	_____
Total Billing	$_____

FIG. 3—How a budget is set up for a construction department. Percentages used are based on past experience.

TYPICAL BUDGET AND PRICING STRUCTURE for a Service Department

Anticipated Material Cost	$31,900	29%	of Sales
" Labor Cost (16,800 hours)	42,000	38%	" "
" Job Expense	4,400	4%	" "
" Prime Cost	78,300	71%	" "
" Overhead	20,900	19%	" "
" Return	10,800	10%	" "
Total Sales	$110,000		

Labor Pricing:

Cost	$2.50/hr.	
Payroll Tax	.14	
O. H. Burden	1.25	(Divide $20,900 O. H. cost
	3.89	by 16,800 Hours)
Return	.01	
Selling Price	$3.90/hr.	

Material Pricing:

Total Anticipated Return $10,800 = _____ = 33.85 percent

Divided by anticipated Mtl. Cost 31,900 = required margin added to cost

Reconciliation of Pricing Budget

Material Cost	$31,900
Return on Material	10,798
Return on Labor @ .01¢/hr	168
	42,866
Labor Sales 16,800 @ $3.90/hr	65,520
Job Expense (not inc. pay tax)	1,614
	$110,000

FIG. 4—Typical budget and pricing determination for operation of a Service Department.

Sturgeon
ELECTRIC COMPANY

APPLIANCE INSTALLATION AGREEMENT

_____ 195__

STURGEON ELECTRIC COMPANY, INC. hereby agrees to perform for_____, Dealer, all electrical work, including the furnishing of necessary materials, for the installation of the appliances listed in the attached schedule, when in place at the purchaser's location in Denver, Colorado, or within ten miles thereof, at the unit prices stated in said schedule.

And, in consideration of the foregoing, the said Dealer agrees to have all of such installation work done by Sturgeon Electric Company, Inc., during the existence of this agreement.

All electrical work, circuit loading, etc., in said installations shall meet the requirements of the Electrical Inspection Department of the City and County of Denver.

While this agreement is in force, Sturgeon Electric Company, Inc., will not sell the appliances listed in the attached schedule in competition with the Dealer, and will refer to the Dealer any inquiries received from the Dealer's customers concerning the purchase of additional appliances.

Each party shall have the right to terminate this agreement by giving the other party 30 days' written notice. This agreement shall not be amended except by mutual agreement of the parties in writing.

STURGEON ELECTRIC COMPANY, INC.

By_____ By_____
Dealer

FIG. 5—Appliance installation agreement between contractor and dealer. Flat rate, unit prices are used.

is required to support this type of work than is required for ordinary business operation. The following basic organization is required for the Service Department: Service manager and salesman, warehouseman, shop repairman, dispatcher, pricing clerk and invoice clerk.

By virtue of the fact that each one of the contractor's Serv-

(*Continued on page 229*)

How Price Curbs Will Work

Electrical construction work goes under a new Ceiling Price Regulation. It aims at controlling price by a rein on mark-up. Target date is Nov. 1st.

To meet publishing schedules this article was prepared before final approval of the construction price order. The official order may include some minor differences as a result of last minute changes.

THE new OPS construction industry ceiling price regulation requires that you establish a ceiling price for your sales on construction and related services and installed materials. If you wish, you can still use ceilings computed under CPR-34, the OPS order for service trades issued May 11, 1951. The new regulation gives the contractor a break in figuring bid prices, however, and should therefore be carefully studied and analyzed.

The following is a re-write of the official order just prior to final approval, trimmed of the confusing legal phraseology as much as possible, which tells you not only what the order says, but what it means. You should immediately obtain a copy of the new regulation (also a copy of CPR-34 if you do not already have one), then use the following to help you interpret the regulation.

Who is Covered

Prime contractors, subcontractors, any person who makes the kind of sale or supplies the kind of service, or makes the kind of purchases covered by the new OPS regulation are included under the order.

What is Covered

The new OPS regulation covers any transaction in which the seller furnishes labor, or any combination of labor, materials and services for building, highway, heavy, railroad and miscellaneous construction. This includes the installation of materials or equipment into a building, structure, or construction project, or on a right of way, either in new or additional construction, or otherwise; the removal of materials or equipment from the project; or the repair, remodeling or alteration of an existing building, structure or construction project; the installation and repair or production and processing of facilities whether or not connected with building construction.

The new regulation also covers shop fabrication by the installer, of materials to be installed by him in connection with any of the foregoing projects, if sold on an installed basis only.

What Isn't Covered

The new regulation does not cover the following types of transactions:

a. Field erection or installation of equipment or machinery covered by CPR 30.

b. Household appliances under the following conditions:

i. The separate installed sale of appliances such as domestic refrigerators, washing and ironing machines, portable air conditioners, cooking ranges and stoves when the cost of installation is incidental.

ii. Repair and maintenance of these appliances.

c. The prices of materials or equipment if it was your practice during your base period to sell material or equipment which you manufacture to specification without installing it, or to quote separate from installation charges, or to quote or bill both ways. (Where you sold material or equipment on installed basis only, the entire transaction including your manufacturing or shop fabrication, is covered by this regulation).

d. Charges for the erection of fabricated structural shapes, plates and related products by the producer.

e. Contracts to maintain domestic oil burners or comparable equipment over a stipulated period of time; cesspool cleaning; water softening services and installed sales of standard floor coverings such as linoleum.

Building construction includes the erection and construction of building structures intended for shelter, protection, comfort or convenience, and of production and processing facilities. The term includes the demolition of buildings and structures (but does not include "wrecking services"), excavations, clearance of sites and leveling for foundations, the installation of plumbing, heating, air conditioning and like equipment, and all modifications, alterations, additions and repairs.

Highway construction includes the construction of roads, streets, alleys, driveways, sidewalks, guard rails, fences, parkways, parking areas, airports, bridle paths, athletic fields, highway bridges, grade separations involving highways, sewage, drainage and water works improvements incidental to street and highway improvements, and all electrical work at the site of construction.

Heavy construction and railroad construction includes railroad construction projects, railroad bridges, sewers and water mains, grade separations involving a railroad, foundation, pile driving, piers, abutments, retaining walls, viaducts, tunnels, subways, track elevation, elevated highways, drainage projects, aqueducts, irrigation projects, flood control projects, reclamation projects, reservoirs, water supply projects, water power development, hydroelectric development, transmission lines, pipe lines, locks, dams, dikes, levees, revetments, channels, channel cut-offs, intakes, dredging projects, jetties, breakwaters, docks, harbors, industrial sites, all earth moving (including excavation and disposal of overburden and the loading of all materials from which overburden has been removed).

Miscellaneous construction includes landscaping, tree trimming for maintenance of power lines, water well-drilling, installation of concrete burial vaults, contract mining operations, scaffolding construction, house moving, waterproofing, damp proofing, fireproofing, insulation, and all structural steel erecting except that excluded under the provisions of Section 3 (d) of the regulation.

July 1, 1949 through June 24, 1950 is the base period.

Table I. CEILING PRICES FOR SALES, SERVICES, OR MATERIALS ON LUMP-SUM CONTRACTS

A lump-sum contract is a sale in which your selling prices includes all your costs, overhead and a profit. To find your ceiling price for a lump-sum job you must:

1. Find the profit markup over the same cost base which you had in effect during your base period on a comparable job.

2. Decrease that markup by 10 percent. (If your profit markup over the same best base was 15% during your base period, you must now use 13.5%.)

3. Multiply this lesser profit markup by your estimated total current cost to you of the part of your cost base figured accordingly to your base period practices, and using cost in effect at the time you make your bid.

4. Find the markup for overhead over the same cost base for overhead which you had in effect during your base period for a comparable contract.

5. Multiply the markup for overhead by the estimated total current cost of the parts of your cost base figured accordingly to your base period practice and using the cost in effect at the time you made your bid.

6. Find the estimated total current cost to you exclusive of overhead costs covered by your markup for overhead (4) using your customary base period practices and the cost in effect at the time you make your bid.

7. Add the amounts for profit (3), overhead (5), and costs (6). This is your ceiling price.

Lump-sum contracts converted to unit prices. If you are requested to submit a bid on certain types of work in terms of unit prices for various types of work, you may adjust your submitted unit estimates in any manner so long as the total amount for the bid is no greater than the lump-sum ceiling price. Such adjusted bid prices in effect during your base period must not be used in establishing prices later.

Escalator clause. If your buyer agrees, you may provide for later cost increases no greater than those allowed by this regulation at the time such cost increases are incurred by you.

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a. Base period markup is the highest percentage markup for profit, overhead or for profit and overhead which you had in effect during your base period over a cost base for any type of job or installation which you performed or upon which you made a bid.

b. Base period price is the highest price you had in effect to each class of buyer during your base period for each type of construction.

Prices Under CPR 34

a. You may sell or continue to sell a construction service covered by this regulation at the ceiling price or markups which you established and reported under CPR 34. This does not affect your right at any time later to put into effect the ceiling prices or markups as computed or recomputed over appropriate cost base under this regulation.

b. If you make a sale of a construction service after the issuance date of this regulation in which the price you charge is higher than your ceiling price under this regulation but not higher than the ceiling price established under CPR 34, you must file with your OPS office, a statement setting forth the price you are charging and state that you have priced it under CPR 34, naming the District Office with which you filed your report.

c. You are not required to recalculate, under this regulation, the ceiling prices you established with CPR 34 for 1) a job in progress at the issuance date of this regulation; or 2) for a job you commenced, before the effective date of this regulation, according to a written contract entered into, or a written bid made before the date of issuance of this regulation.

Ceiling Prices

Contract Basis: Sales on a contract basis includes—1) lump-sum contracts; 2) cost-plus fixed percentage fee contracts; 3) cost-plus fixed dollar fee contracts; and 4) cost-plus with guaranteed limit (upset price).

Summary of pricing method. This regulation allows you to figure your ceiling prices in relation to current costs. By this method you use ⅔ of the base period markup for profit on similar jobs over your estimated or actual costs, as the cases may be. Your base period markup for overhead remains the same. Application of this method is described in detail for various types of contracts in Tables I to IV.

Current Costs and Cost Base

Current costs are the costs to you of labor, materials, equipment, subcontractors charges, and incidental expenses incurred in fulfilling your contract. They are figured as of the date you made your bid for a lump-sum contract and as of a date on which a cost is incurred under a cost-plus contract and must not be higher than WSB or OPS applicable ceilings.

Cost base is 1) that group of costs to which, in accordance with your regular base periods accounting and estimating procedures, your markups for profits, for overhead, or for combined profits and overhead are applied in arriving at your total bid price for a lump-sum contract, or 2) that group of costs for which under the terms of cost-plus contract, your fixed percentage fee is applied.

Profit markup is the highest percentage markup for profit (as distinguished from a markup for overhead) which you had in effect during your base period for the sale of a comparable construction service to the buyer of the same class.

In establishing your base period markups or your base period percentage fee, the base period you use for comparison must have the same cost base as the contract for which you are establishing a ceiling price.

Unable to Price by These Methods

If you can not price by any of the above methods, can not find your ceiling markups or fees, you must apply to your OPS District Office giving the information listed below. Your ceiling prices requested in your application must be comparable to the ceiling prices of your most closely competitive seller of the same or similar services and in line with the ceiling prices established under this regulation.

Your application must contain the following information:

a. Your name and address;

b. Kind of sale or sales to be made;

c. Where sales are to be made;

d. When you first began to make such sales, if you made any before this regulation was issued;

e. Whether or not you established ceiling prices under CPR 34; if so, the prices so established by you and the OPS District Office with which you established these prices;

f. Reason why you can not price under the methods given above;

g. The markup for overhead and the markup for profit which you propose and why you believe these are in line with markups established under this regulation;

h. The name and address of your most closely competitive seller in your locality; and his ceiling prices under this regulation for the same or similar sales if his prices are available to you;

i. The cost base upon which your proposed markups are to be applied.

Time and Materials, Hourly Rate, or Installed Sale Basis

A sale based on an hourly charge for labor alone or on an hourly charge for labor plus separate charges for materials, equipment installed, or equipment used as needed for that service, is priced as follows:

1. The sum of the applicable ceiling prices, figured according to the following:

a. *Labor charge.* To find your ceiling hourly charge for labor you must:

i. Find the highest hourly charge which you made to a buyer of the same class for each kind of labor during the base period;

ii. Find the base period hourly cost to you of each such kind of labor. This cost must be established for the same payroll period as the hourly charge found in (i) and must include the hourly wage rate paid by you plus the applicable payroll costs per hour.

iii. Find the current hourly cost to you of each kind of labor, including payroll costs.

iv. Subtract for each kind of labor, the amount found in (ii) from the amount for the same kind of labor found in (iii).

v. Add, for each kind of labor, the amount found in (iv) to the base period charge found in (i). This is your ceiling charge for labor.

b. *Materials charge; installed equipment charge.* To find your ceiling charge, you must:

i. Find the highest percentage markup over the materials or the equipment cost which you had in effect during the base period for material or equipment of the same category for a buyer of the same class.

ii. Separate this percentage markup into profit and overhead. (For example, if your base period markup (i) was 30%, 10% may represent your overhead expense and 20% your profit).

iii. Diminish your profit markup by 10%. (If your profit markup was 20%, you must now use 18%).

iv. Add your overhead percentages (ii) to your diminished profit percentage (iii). This is your total markup.

v. Multiply the current cost to you of the material or the equipment installed by this markup (iv). This is your profit and overhead.

vi. Add the current cost to you of the material or equipment to this amount (v). This is your ceiling charge.

c. *Use of construction equipment.* To find your ceiling charge for the use by you of an item of construction equipment owned by you, you must:

i. Find the highest hourly charge which you had in effect during your base period for an item of construction equipment of the same kind for a buyer of the same class.

ii. Find the base period replacement cost for that item of equipment.

iii. Find the current replacement cost to you of that equipment.

iv. Divide the current replacement cost (iii) by the base period replacement cost (ii).

v. Multiply the base period charge (i) by the figure found in (iv). This

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Table II. CEILING PRICES FOR SALES ON COST—PLUS FIXED PERCENTAGE FEE CONTRACTS.

A cost—plus fixed percentage fee contract is a contract to perform a job for a fixed percentage fee over costs, the fee to cover your overhead and profit. You figure your ceiling price as follows:

1. Find the highest percentage which you used as a fee in a cost—plus percentage fee contract in which the costs were most nearly like the contract you propose to perform.

2. Separate (1) into the percentage representing overhead and that representing profit. (For example: 15% might be overhead and 5% profit.)

3. Lessen your profit percentage by 10%. (If 5% is your profit percentage, you must now use 4.5%.

4. Add your overhead percentage fee as found in (2) to your diminished profit percentage (3). This is your ceiling percentage fee which may be added to current costs of all the costs of the contract.

Table III. CEILING PRICES FOR SALES ON COST—PLUS FIXED DOLLAR FEE CONTRACTS

A cost–plus fixed dollar fee contract is a contract to do a job for a dollar fee over costs; the fee to cover your overhead and profit. You figure your ceiling price for this type of contract as follows:

1. Find the dollar amount which you used during the base period as a fee in a similar contract in which the costs were most like the contract you propose to perform.

2. This dollar amount is your ceiling dollar fee and may be added to the current costs of all the elements of cost in the contract.

is your ceiling charge for use of equipment owned by you.

d. *Use of equipment not your own.* To find the ceiling hourly charge for an item of equipment not owned by you but rented from others, you must:

i. Find the highest percentage markup over your rental costs, operating costs, or rental and operating costs which you had in effect during your base period for equipment of the same kind for a buyer of the same class.

ii. Separate the percentage markup found under (i) into the percentage representing overhead and that representing profit (plus your operating expenses if they are not otherwise figured).

iii. Diminish your profit markup found in (ii) by 10%.

iv. Add the diminished profit markup (iii) and your overhead markup (or overhead markup plus your estimated operating expenses) as found in (ii). This is your total markup.

v. Multiply this total markup by the current cost to you of rental, or by the current cost of operating expenses, or by the current cost of rental plus operating expenses, whichever was your practice during your base period.

vi. Add this amount (v) to the current cost to you of the rental alone if your estimated operating expenses were provided for the base period markup over the cost of the rental. If your base period markup did not include your operating expenses, add the amount found in (v) to the sum of the current cost of the rental plus the current actual cost of your operating expenses. This is your ceiling charge.

e. *Installed sales.* To find your ceiling price for the sale of an item of material or equipment, together with installation service, billed to the buyer as a single charge, you must:

i. Find the highest percentage markup over the cost to you of the item, or over the cost to you of the item plus the installation service required, which you had in effect during your base period to a buyer of the same class.

ii. Separate the percentage markup found under (i) into the percentage representing overhead and that representing profit (plus your estimated installation cost if it is not otherwise figured).

iii. Diminish your profit markup found in (ii) by 10%.

iv. Add the diminished profit markup (iii) to that part of your base period overhead markup (or overhead plus your installation expense) as found in (ii). This is your total markup.

v. Multiply this total markup by the current cost to you of the item alone or by the current cost to you of the installation service or by the curent cost to you of the item together with the installation service, whichever was your practice.

vi. Add the amount found in (v) to the current cost to you of the item alone if your estimated installation [illegible] provided for in your base period markup. If it was not included in your base period markup, add the amount found in (v) to the sum of the current cost to you of the item plus the current actual cost of the required installation service. This is your ceiling price for installed sales.

Definitions

Class of purchaser is determined by your own practice of setting different prices for different buyers or groups of buyers. Your practice may be based on the characteristics of the buyer, his location, or the quantity bought by him. If you have made a practice of giving an individual customer a price differing from that charged others, that customer is a separate class of purchaser.

Classifications or *kind of labor* is a job with a regular hourly rate of pay. (Such as; master plumber, carpenter, steamfitter, helper, common laborer, etc.)

Installed sale is the separate sale of an item of equipment or material together with the service required to install it, billed to the customer as a single charge.

Most closely competitive seller of the same class is the seller with whom you are in most direct competition. He is one who sells the same type of commodity to the same class of buyer in similar quantities on similar terms and with about the same amount of service.

Payroll costs are payroll taxes, cost of pension and insurance plans, and premiums for compensation, labor, and other required insurance based upon the labor rate, but does not include association dues even if based upon your payroll.

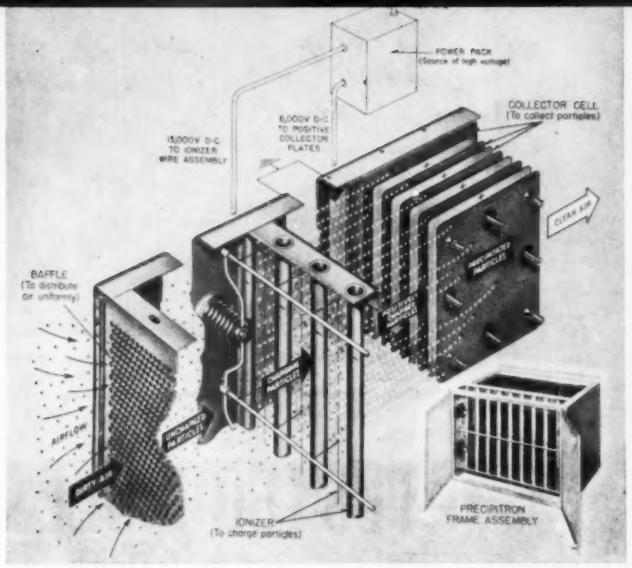
Shop fabrication includes shop costs (labor, materials, and shop burden) necessary to the making in your own shop or plant of materials for installation as required to fulfill your contract. Cost of material must be based on purchases from your customary sources of supply.

Subcontractors' charges is the actual cost to you of work performed by another on a part of your total job or contract. His charge for such work must not exceed his ceiling price established under this regulation.

Table IV. CEILING PRICES FOR SALES ON COST—PLUS WITH GUARANTEED LIMIT (UPSET PRICE)

This is a contract in which you establish a lump-sum price, no greater than your ceiling price (Table I), and which is the highest price your buyer must pay you, but in which the buyer shall share in any saving below this price, as measured by operation at cost plus a percentage (or other) fee. In such a contract, any price not exceeding the upset price may be paid and received.

Electronic Air Conditioning



CUT-AWAY VIEW illustrates the basic operating principle of the Precipitron.

To clean and purify the air in a Pennsylvania theater, electronics has stepped into air conditioning.

By J. C. Reynolds

General Engineering Specialist
Westinghouse Electric Corporation

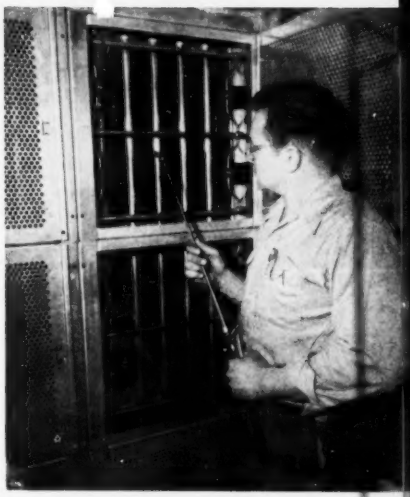
ONE of the first theaters in the country to provide all-electric air conditioning, air cleaning, and air sterilizing is the 600-seat Manos Theater at Tarentum, Pa. Recently remodeled, this suburban Pittsburgh movie house boasts a modern air conditioning system that includes the Precipitron and bactericidal Sterilamp.

Fundamentally, the Precipitron operates on the electrical principle that objects with unlike electrical charges attract each other. The air to be cleaned is passed through an electrostatic field created by small tungsten wires carrying about 12,000 volts dc. This high voltage causes the air to ionize, or break down into positive and negative ions, or electrified particles. The negative ions are drawn back to the positively charged wires (unlike charges attract) but the positive ions travel toward negatively charged metal tubes at about 140 miles an hour, striking and sticking to dust particles on the way. The positively charged dust particles then enter a dust collecting cell consisting of alternately charged aluminum plates set edgewise vertically to the air stream. The dust particles are attracted to the oppositely charged plates where they remain until periodically washed off. This process is effective in removing particles as small as 1/250,000 of an inch in diameter, including oil mist and tobacco smoke.

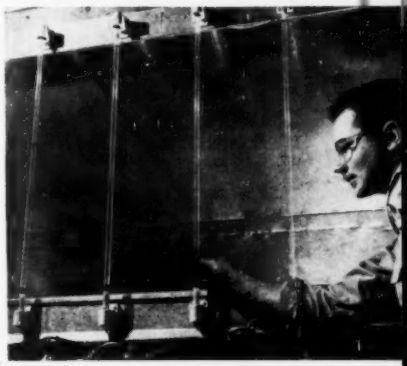
After the air leaves the Precipitron, it passes through a duct in which are installed six germicidal Sterilamps. Designed to emit ultraviolet radiations in the region of 3680 Angstroms, the Sterilamp kills approximately 95% of all air-borne bacteria. Consuming only 40 watts each, six Sterilamps are effective in hygienically treating all the air circulated through the system.

This triple application of electrical equipment has resulted in the ultimate in patron enjoyment, and represents a forward step in the utilization of this type of equipment in the entertainment industry, to give promise of even more comfortable and healthful facilities in the future.

Complete satisfaction has been expressed by the management and public reaction has been enthusiastic.



After their **PERIODIC WASHING,** the Precipitron dust collecting plates are sprayed with an adhesive substance.



These **GERMICIDAL STERILAMPS** in the air duct kill 95% of the air-borne bacteria.

MAINTENANCE ELECTRICIAN'S KIT contains assortment of insulated-handle screwdrivers, hack saw, rubber and friction tape, solder and solder paste, pliers and wrenches, calipers, files, sand- and emery-paper, flash light and small meters for testing and measuring electrical characteristics in the field.

WIPING COMMUTATOR with a strip of folded heavy canvas should be done on every inspection trip, holding canvas firmly against commutator surface while machine is running.

TESTED RULES

"Look, smell and listen" is practical maintenance wisdom, for potentially-dangerous motor conditions frequently can be detected through abnormal appearance, odor or noise. The following useful maintenance hints are in daily use, saving money, material and man-hours for hundreds of contract customers.

By Walter J. Prise
Chief Engineer
The Maintenance Co., Inc.
New York, N. Y.

PEAK industrial production and efficient operation depend as much upon maintenance as upon initial selection and installation of equipment. Regardless of potential effectiveness, machines cannot deliver designed output unless operation is trouble free. Allowing equipment to run to the break-down stage is antiquated. For mass production, overloaded schedules and losses resulting from idle equipment and idle manpower demand continuous, uninterrupted operation. This means that modern plants *must* subscribe to carefully planned and executed maintenance programs incorporating periodic, systematic inspections by competent men.

While thousands of large organizations have their own maintenance departments, thousands more rely on the know-how, equipment and personnel of independent service companies specializing in maintenance by contract. The Maintenance Company, for example, serves more than a thousand customers in the New York metropolitan area on this basis. With their costs of organization and operation divided among their many customers, charges to each account are reasonable. Yet these moderate charges, multiplied many times due to the company's scope of service, justify the expenses required to obtain the best equipment and men available. Moreover, through experience gained through constant repetition, such an organization can develop tested inspection routines and repair techniques that pay off in uninterrupted, highly-efficient motor operation.

While details of maintenance vary according to types of plants, machines and operation schedules, general rules are of definite assistance to inspecting electricians and mechanics. And, when these rules—supplemented by special instructions to take care of unusual conditions—are consistently and honestly followed, they produce satisfactory results. General rules, issued to inspectors of the Maintenance Company, include the following:

1. Check the general condition of motors, controls and wiring but pay *particular attention* to commutators, slip rings, brushes, brush holders, contacts and bearings.

2. Excessive sparking on commutator should be corrected immediately. If this is impossible, *report condition promptly to supervisor.*

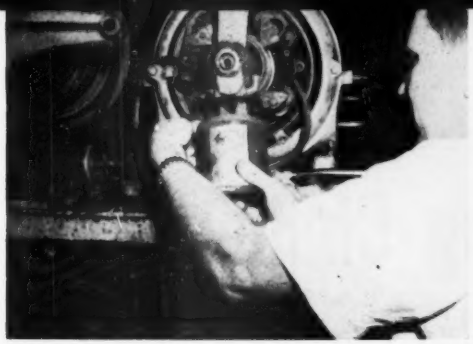
3. Wipe surface of commutator with heavy canvas on every inspection.

4. Watch for shorts and opens on commutators.

5. Opens can be detected through pitted commutator or snappy green sparking. If trouble is not located, *report to supervisor.*

6. Watch for high mica and undercut when found. But do not undercut either a Sprague motor or a slowly revolving machine.

7. Oil on the surface of a commutator



DRAINING OIL from bottom plug of bearing housing frequently reveals the presence of metal particles, indicating the excessive wear of bearings.

CHECKING BRUSH MOVEMENT and tension of springs is another requisite of a maintenance inspection. Brushes should be replaced when badly worn or too loose in the holders.

for MOTOR MAINTENANCE

can be removed by applying powdered chalk to absorb the oil, then wiping the commutator clean.

8. Shorts can be detected by hot bars, discoloration, a ring of fire around the commutator, or solder thrown from a riser. Shorts can frequently be removed by a ground hack saw blade, then filled with compound. If short persists, report to supervisor.

9. Replace brushes when they are either loose in the holders, worn more than 65%, or in danger of becoming too short before the next inspection.

10. So that brushes may be renewed on schedule, place an advance order for replacements when the brushes are worn to half of their original length.

11. *On every inspection*, check the freedom of brushes in brush holders, see that they are properly seated and riding on the commutator properly, check the tension of brush springs, and note unusual sparking, chattering or vibration.

12. In the event of an emergency replacement of brushes, mention this fact to your supervisor and *do not consider an emergency repair as a permanent replacement.*

13. Clean brush holder, rigging and brushes.

14. Return brushes to their original position in their original holders. *Do not forget brushes on the bottom.*

15. Use either sand paper or a brush seater to properly seat new brushes.

16. To check seating of new brushes, run machine under full load or at normal operating load to be sure brush efficiency carries current.

17. When filling bearing housing with oil, keep nozzle of oil can clean to prevent dirt from entering bearing. If at all possible, fill from overflow cup.

18. Check overflow for "breathing", cleaning hole with a piece of wire if clogged.

19. Check bearing for overheating. Although there are exceptions, if you can hold your hand on the bearing it is functioning satisfactorily.

20. When a hot bearing is located, change the oil, check the rings for movement and flush the bearing with a solvent. If the overheating continues, report this condition to your supervisor.

21. Unless otherwise instructed, change oil annually.

22. Movement of bearing should be checked by hand, as excessive play is indicative of possible internal wear.

23. Keep bearings clean and watch residue, for, by noting its color and content, you may detect particles of metal indicative of excessive wear.

24. When draining old oil, be sure to remove bottom plug.

25. On ball bearings, change grease once a year for machine operating 8 hours a day. For two-shift operation, change grease every 9 months. For round-the-clock-service, change every 6 months.

26. Wool packing bearing linings should be removed and inspected annually. To keep linings soft and pliable, add a drop of oil every 6 months if machine is in operation 8 hours a day. Oil should be added every 4 months for 2-shift operation, and every 2 months for round-the-clock service.

27. Roller bearings should receive same attention as ball bearings.

28. To keep bearing grooves clean, wash them *only in the shop*. This is not a job-site operation.

29. Remove accumulations of dirt and dust on, and inside of motors, regularly, since this is a prime cause of overheating, sludge formations and resultant shorts.

30. Tighten all connections on every inspection trip and check condition of wire for damage due to mechanical faults.

31. Replace all covers and notify supervisor of missing covers for outlet boxes, junction-boxes, etc.

32. *On control equipment*, check tension of springs to see whether there is sufficient flexibility remaining. Also check condition of shunts, replacing if necessary.

33. Check all parts for freedom of movement.

34. Control equipment should be checked regularly for mechanical tightness and worn parts.

35. Watch for excessive arcing. If it cannot be corrected, report to supervisor.

36. Watch for fluids, dirt or debris dripping on the control equipment, providing protective shielding to eliminate these hazards when found.

37. If one of the contacts needs replacing, replace both the moving and stationary contacts, otherwise misalignment may result.

38. Closing contacts should have a wiping motion to assure proper setting. Check this.

39. Contacts that are oxidized, crystallized or worn to half their original thickness should be replaced promptly.

40. File contacts *only as an emergency measure*, for contacts in this con-

(*Continued on page* 231)

LIMITED SPACE

An Engineering Challenge

Keen analysis and design resulted in the

1) precision installation of a substation in confined space,

2) remote control of high-voltage switching,

3) banked secondary distribution, and

4) unique suspension details of lighting fixtures

at International-Plainfield Motors' new assembly plant.

By Ralph C. Hodges *Electrical Engineer Wigton-Abbot Corporation Plainfield, New Jersey*

PROGRESSIVE planning, innovations of design and unusual attention to installation details characterize the modern automotive plant recently completed for the International-Plainfield Motor Company in New Jersey. For this assembly center, enlarged to answer urgent defense-sponsored calls for Mack truck motors, combines and expands the facilities of over 30 formerly-separated structures. Several of these structures were demolished to make room for the new plant. Other buildings—modern in their own right—were incorporated into the over-all structural and electrical plan. And machinery and equipment from distant depots was transferred to the new site. Installation problems were understandably numerous, yet they constituted a challenge prompting analysis and execution of a high order.

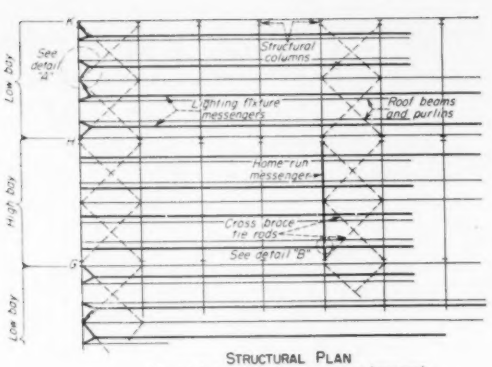
One of the initial problems concerned the location of the main substation, for it was desired to place incoming power lines near the center of the plant; an area already generally occupied by previously-erected buildings. However, there did exist an enclosed ell-shaped court, varying in width from 20- to 30-feet and, by temporarily opening a trucking entrance through one of the enclosing walls, it was possible to move materials and equipment into these central, but somewhat cramped, quarters. After the outdoor substation was assembled, the truck entrance, as well as windows opening on the court, were bricked up. Surrounding parapet walls were surmounted by corrugated asbestos barriers to prevent maintenance personnel from inadvertently coming into contact with high-voltage equipment, and the open ends of the ell were closed by link-chain and barb-wire fences. It was a precision shoe-horn installation.

Ram-Driven Undertrack Service

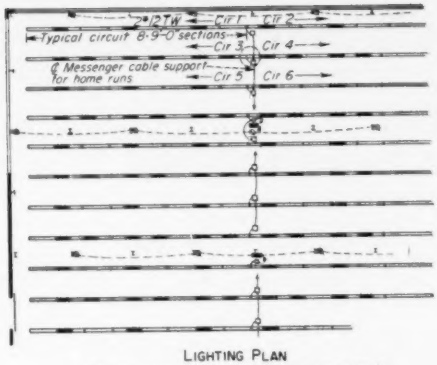
The fact that the plant was separated from the utility trunk lines by a busy 8-track railroad section posed a second problem; solved by hydraulically driving a series of 4-inch galvanized-iron ducts under the railroad embankment for a distance of about 100 feet, using a conical pilot on the leading length of pipe and driving the ducts forward in 5-foot thrusts. Two 26.4-kv 3-conductor lead cables were then run from two separate Public Service Electric & Gas Company networks, through this underground service entrance, to a reinforced concrete manhole just inside the plant property line. From there, service was carried to pothead terminals inside the substation court.

With the substation thus located and segregated outdoors, it became expedient to consider a remote-control system with an interior control station. For, with facilities to check and operate high-voltage equipment from within the plant, supervisory personnel would be safeguarded and switching could be accomplished in a fraction of the time that would be required to operate manual controls located adjacent to the outdoor equipment. As installed, the remote control system now operates automatic motorized gang horn-gap disconnects on the two incoming service lines, a 34.5-kv 1,000,000-kva interrupting capacity 3-pole 1,000-amp oil circuit breaker, related potential transformers and electric heaters in the OCB cabinet. The interior control station also monitors transformer temperatures and regulates lights, heaters and breakers in the double-ended metal-clad outdoor substation. Secondary feeder breakers are 3-pole 1,200-amp ACBs rated for 150,000 IC. Transformers are askarel filled 1,500-kva 3-phase units connected 26.4-kv delta/4,160-volt wye.

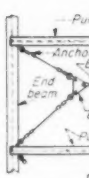
Grounding of all OCBs, transformer cabinets, lightning arrestors, structural and manhole steel is through a continuous ring of 500 MCM bare stranded grounding cable that encircles the substation court 2-feet below grade, and 10-foot copperweld electrode ground-



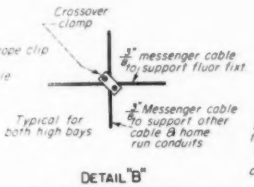
STRUCTURAL PLAN
Showing fixture-supporting messenger framework



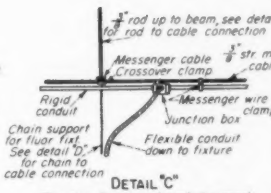
LIGHTING PLAN
Showing wiring channels, fixtures, home runs, panels



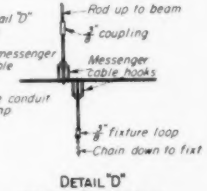
DETAIL "A"
Plan of messenger anchor


Crossover clamp
messenger cable to support fluor fixt.
Messenger cable to support other cable & home run conduits
Typical for both high bays

DETAIL "B"
Plan of messenger crossover


rod up to beam, see detail "D" for rod to cable connection
Messenger cable
Crossover clamp
str. messenger cable
Rigid conduit
Messenger wire conduit clamp
Junction box
Chain support for fluor fixt. See detail "D" for chain to cable connection
Flexible conduit down to fixture

DETAIL "C"
Elevation: fixture and conduit support



DETAIL "D"
Elevation: Right angle to Detail "C"

FLUORESCENT FIXTURES are mounted on continuous wiring channels, with units positioned in accordance with lighting requirements. Supporting messenger cables are secured with two-leg end anchors and clamps at all crossover points.

ing rods driven at all ground net intersections. All junctions between grounding net and equipment are by pressure connectors; no soldered joints existing.

Feeders from main 4160-volt breakers to indoor load-centers are carried underground, running through g.i. conduit to building lines, then through concrete-sheathed fibre duct to points beneath the platform-mounted low-voltage substations.

The decision to keep high-voltage distribution underground was dictated by a combination of safety and economic factors for, while an underground system would admittedly entail the expense of excavation and inclusion of manholes, the actual laying in of fibre duct and cable would be considerably cheaper than installing lines overhead. In addition, an underground job will be protected against damage from storms, moving cranes and the like; the danger of shock or electrocution removed, and appearance greatly enhanced.

Continuity of power is insured at all voltage levels, for primary 26.4-kv service stems from two separate utility networks, either one of which can carry the total plant load. The outdoor double-ended substation is installed in a continuous power loop, providing a dual source for 4,160-volt current into the plant proper. And the two 480-volt plug-in busduct systems installed in the assembly building are tied together through a 600-amp banked secondary run. Continuity of lighting is likewise insured, for adjacent lighting panelboards are fed from different 4,160/208-120-volt transformers, and adjacent blocks of lighting fixtures are phase-balanced on separately switched circuits.

Safety also motivated the specification of askarel-filled transformers. For, due to grinding operations associated with various assembly processes and the resultant existence of air-borne metal particles, dry-type units would be subjected to harmful infiltration.

Long-Range Enclosed-Motor Program

This same reasoning prompted the adoption of a motor-replacement program, and totally-enclosed units are now being installed whenever practicable. Motors, incidentally, are 440-volt 3-phase down to and including ½-hp. Smaller motors are 110-volt single phase, connected to lighting panels through manual thermal switches.

Power for three-phase motors is distributed uniformly throughout the assembly plant by means of five parallel 480-volt plug-in busduct runs; one run extended down the center of each of the five 750-by 40-foot bays. Busduct is mounted 14 feet above the floor (one foot above lighting fixtures), supported every five feet by ½-inch rod hangers attached to roof purlins. Busducts are protected at low-voltage secondary substations by means of 3-pole draw-out ACBs.

It is of interest that, while unit heaters and other equipment having thermostatic controls are connected through 3-pole fused safety switches to these 480-volt busduct runs, the controls themselves are operated at the 120-volt level. This combination again indicates the general emphasis placed on planned safety, for the use of low-voltage control equipment eliminates the possibility of maintenance men unintentionally or unknowingly working on live 440-volt circuits.

The lighting plan is based on the same principle as the power distribution system: providing spare-capacity, flexible, general coverage for the entire 4-acre assembly floor. This provides adequate general illumination while permitting the addition of lighting fixtures where higher intensities are required for critical-seeing tasks.

Continuous wiring troughs on 10-foot centers extend the full 750-feet of the plant's length. They consist of 8-foot channels mounted end-to-end. Fixtures are Benjamin twin-lamp 40-

watt instant-start fluorescent units equipped with safety-type metal-clad lamp holders and 95% power-factor ballasts. Since channels were initially lamped to only 30% of their capacities, there exists the provision for raising original lighting intensities three-fold without altering the basic wiring trough installation.

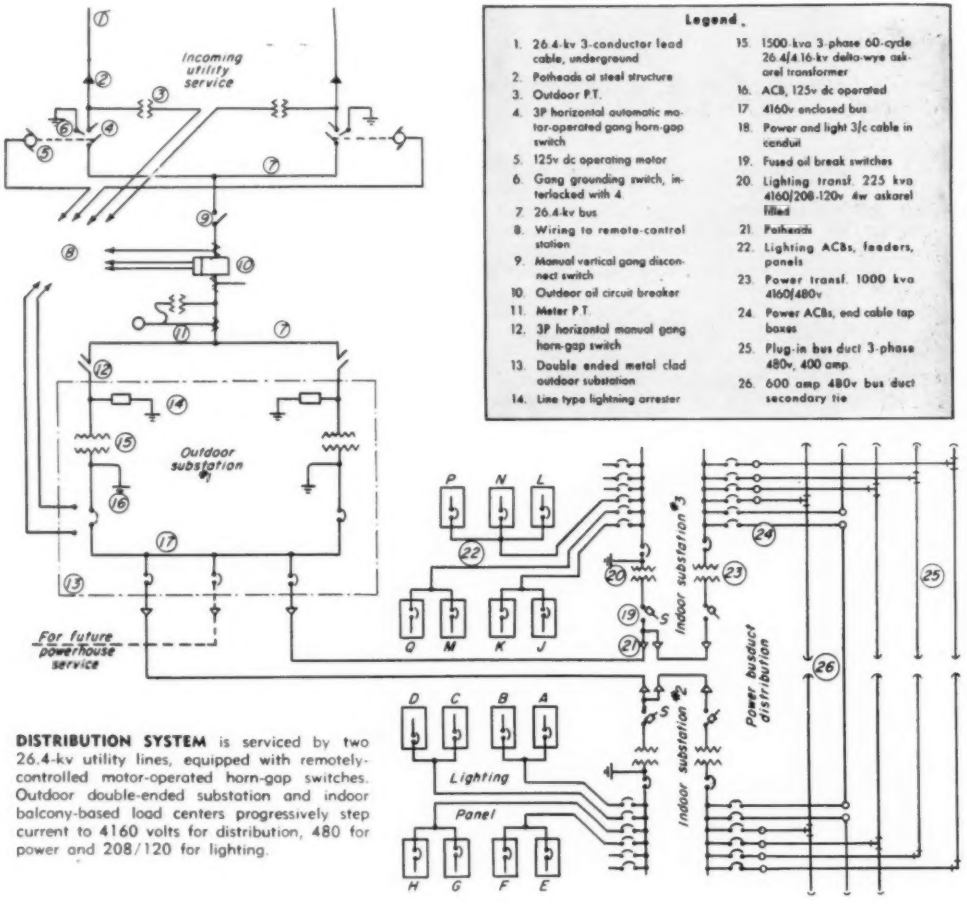
Details associated with the suspension of lighting fixtures once again indicate the accent placed on positive safety, for all long runs of fixture-supporting messenger cable are anchored at terminal points by two-way legs. These legs transfer cable strain to cross beams only at purlin points, thus obtaining a backing-up thrust to sustain the lateral pull.

The wisdom behind this anchoring method is effectively indicated by force diagrams contained in most handbooks on rigging, for it is a proved fact that stresses on the ends of a supporting sling are multiplied geometrically as the supporting cable is tightened to remove the sag; the stress approaching infinity as the catenary flattens to a straight line. Far too many examples exist where this fact has been overlooked and, when cables are pulled taut, then subjected to the loading of fixtures, safety factors have been exceeded. This has resulted in the buckling and deformation of end beams, columns and other supporting structural members. Conversely, when the messenger cable is supported at frequent intermediate points along its length, two-way anchors are used to transmit the load to purlin-backed terminals, and a slight sag is left in the catenary, the installation can be insured against excessive strain or permanent damage.

All of these precautions are observed in the International-Plainfield installation, for 7-strand galvanized steel messenger having a minimum strength of 10,000 pounds is used; cables are supported every 20 feet either by running them over the lower chords of low-bay roof trusses (with clamps at each suspension point) or supporting them by sag-rod hangers in the high bays; ends and all break points are fitted with turnbuckles, thimbles and 3-bolt clamps; two-way anchors transmit strain to purlin points, and fixture channels are supported at both ends by ice-tong hangers and chains adjusted to compensate for the sag of the cable and to level the fixture runs. Conduits carrying circuit wiring are supported by an independent messenger installation at right angles to fixture-supporting lines, and crossing messengers are clamped at all intersection points to eliminate sway possibilities.

All lighting panels are dead-front single-door narrow-type for column

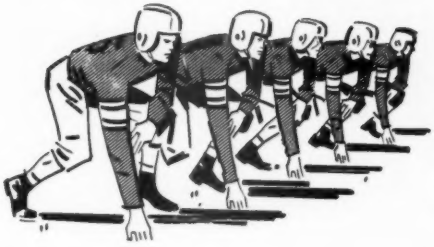
(*Continued on page 230*)


Legend
1. 26.4-kv 3-conductor lead cable, underground
2. Potheads at steel structure
3. Outdoor P.T.
4. 3P horizontal automatic motor-operated gang horn-gap switch
5. 125v dc operating motor
6. Gang grounding switch, interlocked with 4
7. 26.4-kv bus
8. Wiring to remote-control station
9. Manual vertical gang disconnect switch
10. Outdoor oil circuit breaker
11. Meter P.T.
12. 3P horizontal manual gang horn-gap switch
13. Double ended metal clad outdoor substation
14. Line type lightning arrester
15. 1500-kva 3-phase 60-cycle 26.4/4.16-kv delta-wye askarel transformer
16. ACB, 125v dc operated
17. 4160v enclosed bus
18. Power and light 3/c cable in conduit
19. Fused oil break switches
20. Lighting transf. 225 kva 4160/208-120v 4w askarel filled
21. Potheads
22. Lighting ACBs, feeders, panels
23. Power transf. 1000 kva 4160/480v
24. Power ACBs, end cable tap boxes
25. Plug-in bus duct 3-phase 480v, 400 amp
26. 600 amp 480v bus duct secondary tie
Incoming utility service
Outdoor substation #1
For future powerhouse service
Indoor substation #3
Indoor substation #2
Power busduct distribution
Lighting
Panel
P N L
Q M K J
D C B A
H G F E

DISTRIBUTION SYSTEM is serviced by two 26.4-kv utility lines, equipped with remotely-controlled motor-operated horn-gap switches. Outdoor double-ended substation and indoor balcony-based load centers progressively step current to 4160 volts for distribution, 480 for power and 208/120 for lighting.

Make big gains NOW with these hard-smashing

SYLVANIA AD CAMPAIGNS



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FLUORESCENT TUBES, FIXTURES, SIGN TUBING, WIRING DEVICES; LIGHT BULBS; RADIO TUBES; TELEVISION PICTURE TUBES; ELECTRONIC PRODUCTS; ELECTRONIC TEST EQUIPMENT; PHOTOLAMPS; TELEVISION SETS

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Please let me have full details about Sylvania's FREE business-getting campaign for Electrical Contractors.

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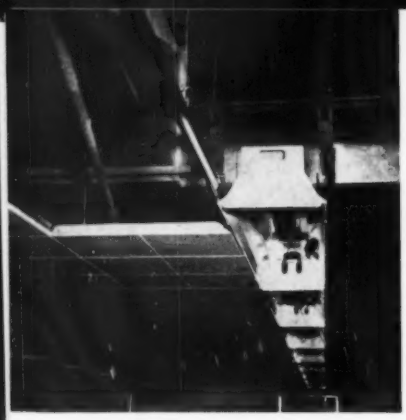

TROFFERS consist of three parts: body assembly, removable reflector, hinged louver bottom. Body assembly is one-piece formed steel channel.

ADEQUATE LIGHTING, proper ventilation and comfortable controlled temperature obtain throughout two large new office buildings of the Farm Bureau Insurance Co., Columbus, Ohio. Airtight custom-built troffers recessed in suspended metal pan ceiling provide 55 footcandles of diffused comfortable illumination.

CHANNEL HOUSING has formed bottom edges which engage in standard T-bars with snap-in fit. Three half-hinges provided along one side, with latches opposite, are for louvers.

Contractor Sells Custom Troffer Job

Electrical contractor Paul L. Gilmore of Columbus, Ohio, solved a difficult lighting problem for two large office buildings by using a specially designed air and dust tight troffer.

By H. K. Flint* and Paul L. Gilmore**

WHEN the plans for the new nine-story Farm Bureau Insurance Building at Columbus, Ohio, were turned over to the electrical contractors, they found themselves confronted with an unusual lighting installation problem: the building's ceilings enclosed an air chamber used to provide continuous circulation for the heating and air-conditioning system. Since a pressure of from three to four psi is maintained, the fluorescent lighting fixtures, recessed in the ceiling, had to be air-tight.

Because standard troffers are not completely air and dust tight, they are not satisfactory for this type of application. A special light-weight, baked enamel luminaire was designed to embody a number of features including a snap-in snap-out reflector similar to the removable reflectors used in industrial luminaires. This feature provided simple and easy maintenance—a factor the contractor considered very important. A pilot installation was made in a temporary office building to enable the contractor to prove to his own satisfaction the feasibility of the design. This installation also demonstrated another feature of the design that lowers construction cost: by installing the fixture without louvres and reflectors at an early stage of the construction work, light was provided during the construction, and temporary wiring was eliminated.

Because of the close tolerances demanded in runs as long as 200 feet, extreme accuracy was essential in both overall length and width of the fixture. To insure easy installation, the normal width of 12 inches was reduced by 1/16-inch to allow the units to fit easily into the T-bar. Latch pins were substituted for the usual wing units on the louvre so that a screwdriver, or any other tool, is not required in the performance of the maintenance work.

The ends of the luminaires are sealed shut to prevent the entrance of dust and any corrosive elements that might be present in the air. A completely enclosed ballast is bolted to a screw that is welded to the unit, again reducing installation time. The design also allows for utilizing the fixture itself as the wiring channel.

Both buildings when completed will have approximately 8500 four-foot sections. Over 5200 units, supplied by Westinghouse, mounted in continuous rows on nine-foot centers, are operating now and are producing 50 to 55 footcandles in all areas.

* H. K. Flint, Lighting Engineer, Westinghouse Electric Corp., Cincinnati, Ohio.

**Paul L. Gilmore, electrical contractor, Paul L. Gilmore Co., Columbus, Ohio.

REVOLUTIONIZES CONSTRUCTION FASTENING!

Cartridge-powered tool fastens steel or wood to concrete or steel in seconds . . . no outside power source

Exhaustive tests prove the new cartridge-powered Remington Stud Driver to be the finest, speediest fastening system ever devised . . . easily sets as high as 5 studs per minute. No other equipment needed. Speeds work and cuts costs. The Model 450 Remington Stud Driver is made by Remington Arms Company, Inc., America's oldest and foremost sporting arms manufacturer. For detailed information and the name of your nearest distributor, fill out and mail the coupon below. There may be slight initial delays in delivery until production and distribution catch up with demand.

"If It's Remington—It's Right!"

Remington DU PONT

LOOK AT THESE EXCEPTIONAL FEATURES

COMPACT AND PORTABLE —Weighs only 5½ pounds, ideal for scaffold, ladder, overhead work, inaccessible places. Comfortable to use in any position.

SPEED—One man can set up to 5 studs per minute, as much as 100 times faster than other methods. Sets stud at whatever depth is required up to 2¾ inches, depending on material.

ELIMINATES INVESTMENT IN OUTSIDE POWER —Self-powered. Especially useful in isolated places.

TRIPLE SAFE—Plainly visible red dot indicator shows when it's cocked; safety must be depressed before and during squeezing of main trigger; permanently attached safety shield must be compressed against work before Stud Driver will operate. Trigger can't be accidentally tripped. Slight recoil. Low noise level.

WIDE VARIETY OF STUDS are available for every fastening job. Genuine Remington studs are trademarked for user's protection. Pull-out resistance as high as two tons in good concrete, depending on stud used. Cartridges are available in 5 power loads covering practically all fastening needs.

UNIQUE, FAST ASSEMBLY OF STUD AND CARTRIDGE —Tough plastic heel cap permits lightning assembly of any cartridge with any Remington stud, identifies power load, protects head and thread of driven stud.

PRICE for Model 450 Remington Stud Driver complete in rugged steel carrying case—only $119.50.

Speeds all these jobs . . . and many more

1. Hanging steel sash and door bucks to concrete and brick.
2. Anchoring wood plates to concrete floors and ceilings for setting partitions.
3. Fastening wood furring strips to concrete for attachment of metal lath.
4. Anchoring suspended ceilings, sprinkler systems and lighting fixtures to concrete.
5. Attaching conduit and panel boxes to steel and masonry.
6. Anchoring light machinery to concrete pads.
7. Erection of signs, awnings and venetian blinds on steel or masonry.
8. Hanging radiator housings to concrete or brick.

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I am interested in obtaining detailed information on the Model 450 Remington Stud Driver

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Soft Grits for Blast Cleaning

A new method for cleaning motors and electrical equipment, using low-cost agricultural by-products in place of sand and steel shot is economical, safe and efficient.

By T. F. Clark and E. C. Lathrop

Northern Regional Research Laboratory
U. S. Department of Agriculture

TROUBLESOME as well as expensive cleaning problems continually arise during maintenance and repair of electrical equipment and machine parts. Poorly-chosen cleaning methods often account for scrapping of parts, loss of man-hours or plant shutdowns. Such losses can be minimized, if not eliminated entirely, by the use of soft grits in conventional sand blasting equipment. The method is essentially fool-proof, involves no toxic liquids or flammable solvents, and is from four to ten times faster than older methods. Machine components cleaned by the soft-grit method require no additional machining or fitting for re-use.

Soft grits from corncobs were developed by the Northern Regional Research Laboratory. Cleaning action of the cobs is accelerated by the addition of rice hulls, a waste product.

In addition to corncobs, several other types of agricultural residues, particularly the shells of nuts and fruit pits, are known to possess physical characteristics quite similar to those of cob grits. Of these, grits from apricot pit shells, coconut shells, the shells of pecans, English and black walnuts, and peach pits have become available in commercial quantities and have been accepted as standard materials.

Grits are prepared by grinding the various shells in either a hammer or attrition mill, with dust and low-density components removed by aspiration. In extensive tests, performed by the Laboratory, the mixture of grits and rice hulls were proportioned 5:9.

Rice hulls appeared to be an essential component of the blasting mixture because grits alone failed to remove the colored oxide film under the welding scale. Because soft grits do not cause pitting, this method appears to be superior to the practice of using steel grits. Pitted surfaces resulting from use of steel grits cause early failure of subsequently applied paint.

Equipment and machines covered with deposits of grease, oil, dirt, metal preservatives or rust preventives are readily cleaned for continued operation, assembly, or painting. The greases, gums, waxes, asphalts or varnishes present in preservatives cause no difficulty of removal by the soft-grit method. For such applications, discarding the grits after one use may be advisable to maintain the method at peak efficiency and avoid contaminants which might ultimately result in blemishes on the surfaces.

Cleaning by soft-grit blasting is particularly effective where the surfaces of the metal under its coat of dirt, scale, carbon, etc., should remain unchanged or otherwise unimpaired.

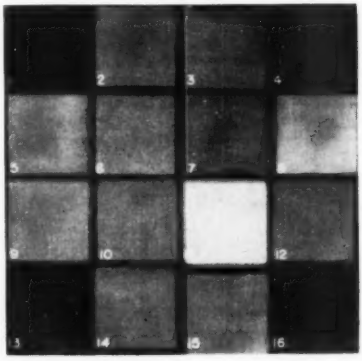
The various factors involved in blast cleaning permit modification of the method to meet immediate circumstances. Combinations of grits and hulls may vary over a wide range, air pressure used may be varied to change the character of the surface finish, and effectiveness of cleaning is altered by the angle of impingement.

An interesting development in the use of soft grits is that in connection with motor armatures. The iron core and the copper commutator rings can be cleaned readily, apparently without affecting the metals. However, it is necessary to mask the wire insulation, which is not resistant to blasting.

One equipment manufacturer recently introduced a moderately-priced pressure-type blasting unit designed specifically for use with soft grits from agricultural residues. Acceptance of this equipment by users of electrical equipment, for degreasing and cleaning large electric motors and generators was almost immediate. Grits from corncobs or hardwood sawdust are preferred materials for degreasing equipment because of their absorbency and efficiency in cleaning electrical equipment without deleterious effects on the insulation and windings.

The soft-grit method of cleaning not only eliminates the hazards surrounding the older methods, but it is considerably more economical in respect to time and materials. The time required to degrease and recondition electrical equipment by this new method is only a fourth to a third of that required by older methods. The soft-grit method is a dry operation, and long periods of drying are not required before the equipment can be replaced in service. Surfaces are ready immediately for painting or varnishing. The low cost of the soft grits allows for their disposal after one use.

Availability of inexpensive equipment designed to handle soft grits should extend the adoption of this method of cleaning to machine shops and the smaller maintenance and repair shops. Numerous potential applications are visualized.



SURFACE FINISHES obtained by blasting various soft grits against a panel of polished aluminum. All grits were numbered 12/30. The 4 corner samples are unblasted aluminum, used for comparison. The other samples were blasted with (2) hard almond shell, (3) apricot pit shell, (5) English walnut shell, (6) red corncobs, (7) soft almond shell, (8) pecan shell, (9) white corncobs, (10) filbert shell, (11) red corncobs and rice hulls mixed in the ration of 9:5, (12) coconut shell, (14) black walnut shell, and (15) peach pit shell.

A PROCLAMATION OF SERVICE

TO: WESCO APPARATUS AND SUPPLY CUSTOMERS EVERYWHERE

By John F. Myers,
President
Westinghouse Electric Supply Co.

An electrical wholesaler – distributor – Wesco or any other – has essentially one reason for being in business today. That is, to give service to customers.

And what is service?

So far as any Wesco customer is concerned the definition is easy. *He wants what he wants when and where he wants it!* To fill that bill can take a lot of doing, and frequently does. But we welcome such challenges to our ingenuity and ability.

It is a far cry back to the "electrical jobber" who merely sold products and considered the sale the end of his responsibility to the customer. Business then was simpler—and duller—and required a different type of IQ. But the electrical jobber served his historical purpose and earned a niche in the infant industry's Hall of Fame.

Then began the almost explosive electrical development of the United States, and with it the growth of the electrical jobber into a wholesaler-distributor. The needs of the power companies, the mushrooming of industry and commerce, and the demands of electrical contractors exacted from the electrical wholesaler a new and broader concept of doing business. To meet these requirements, the wholesaler expanded his operations step by step until today he is recognized as an integral and permanent link in the chain of distribution and use of electrical energy.

Westinghouse Electric Supply Company

A NATIONAL DISTRIBUTING ORGANIZATION WITH 110 OFFICE-WAREHOUSES

The American
Minerva Ohio.
CRESCENT WIRE & CABLE
DRY-TYPE TRANSFORMERS
ILG
AB-I BREAKERS
Sprecht Faraday
American Beauty
G & W ELECTRIC SPECIALTY
OLIVER IRON AND STEEL CORPORATION
ANACONDA WIRE AND CABLE
BERMICO FIBRE CONDUIT—A PRODUCT OF BROWN COMPANY
FUSETRON
TRUSTWORTHY NAMES IN ELECTRICAL PROTECTION
BUSS
Consult with
BURNDY
NATIONAL ELECTRIC PRODUCTS
ALCOA
GENERAL CABLE
PRŌTEX
PENN-UNION
ELECTRIC FEEDRAIL

WESCO GROUP of

The past 25 years have seen Wesco progress from uncertain first steps to a position of leadership in its field of operations. In the last 10 years, the growth has been astounding, in keeping with the demands of Wesco customers. The total of 66 branches in 1938 is now 110 located in 46 states. Today, Wesco markets 18,000 different items, more than three times the variety of ten years ago. And in 1950, Wesco dollar business was several times the largest pre-war year.

This expansion was not mere luck. Long ago Wesco realized that every electrical wholesaler sold products—frequently the same products. A strictly product approach to a customer offered nothing that competition could not duplicate. The problem was to develop distinguishing Wesco *pluses* which would enlist the customer's interest and appreciation, build repeat business and establish a permanent friendly relationship.

Thus began the constructive steps now grouped under the title of "Service". Over the years they have been tested in daily use and proved useful, beneficial, and practical for the customer. *Here is what Wesco offers to every customer:*

1. Adequate stocks of Electrical Apparatus and Supplies kept constantly available in 110 strategic locations throughout the country.
2. Essential technical data, local electrical codes and up-to-date catalog information.
3. Aid in the application, installation and maintenance of electrical equipment to insure maximum operating efficiency.
4. Service as an expediter through wide knowledge of markets and suppliers; the ability to procure electrical items; effective follow-through.

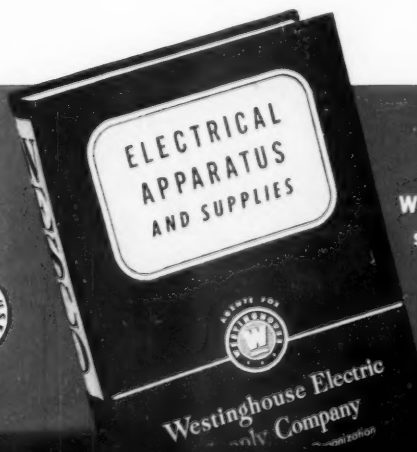
Westinghouse Electric Supply Company

A NATIONAL DISTRIBUTING ORGANIZATION WITH 110 OFFICE-WAREHOUSES

The American
Minerva Ohio.
CRESCENT WIRE & CABLE
DRY-TYPE TRANSFORMERS
Sprecht Faraday
ILG
AB-I BREAKERS
American Beauty
BERMICO FIBRE CONDUIT—A PRODUCT OF BROWN COMPANY
OLIVER IRON AND STEEL CORPORATION
ANACONDA WIRE AND CABLE
CENTRAL CONDUIT
WIREMOLD
BRYANT
ECONOMY O.Z.
SANCHAMD
Republic ELECTRUNITE
EDWARDS
EDCO
EVEREADY
Wire-Mate
Mo-Line Motors

BUSINESS SERVICES

5. A corps of field specialists and trained salesmen who work together to meet customers' requirements.
6. Easily arranged credit services.
7. Knowledge of the requirements of local markets.
8. Assembly of all parts of an order in one shipment if desired.
9. Fast and efficient flow of materials to a job in keeping with customers' work schedules and other requirements.
10. Speed in filling orders through daily contacts with supplying manufacturers.
11. Pooling of stocks from several Wesco warehouses to complete large hurry-up orders.
12. Intelligent over-the-phone service by seasoned "inside men" who are experts in their field.
13. A price policy which assures that Wesco's prices will be competitive.
14. Wesco's assurance ot customer satisfaction backing up the product manufacturer's guarantee of quality and performance.
15. Courtesy, consideration and prompt attention whether your needs are large or small. The customer comes first with Wesco.
16. What you need—when you need it—where you need it—from one source of supply—conveniently located near you.



Every Wesco customer should have a free copy of this latest catalog. Use coupon at right.

MAIL THIS COUPON TODAY!

Westinghouse Electric Supply Co.
Box 25, Wall Street Station
New York 5, N.Y.

☐ Please send my copy of the Wesco Catalog #100
☐ Have your representative call

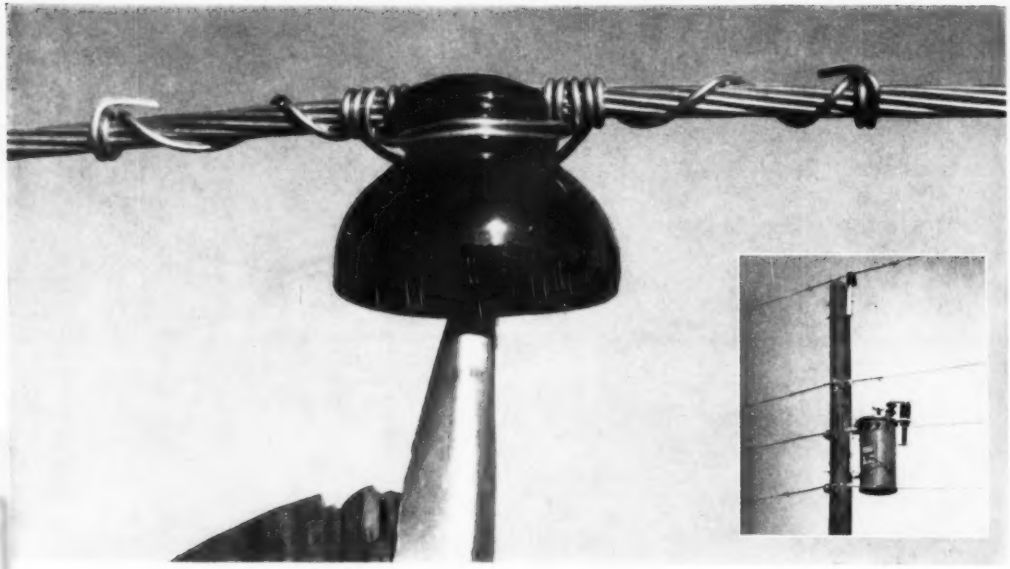
Name_____

Company_____

Address_____

City_____ Zone____ State_____

Please print clearly



When you ask Wesco for Alcoa A·C·S·R

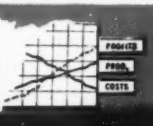
You get the finest *product* that 55 years of aluminum cable experience can give you—the best uniform stranding, uniform lengths, highest-quality aluminum conductor and galvanized steel core wire.

Alcoa Accessories, too, are available through Wesco . . . designed to give dependable top performance with Alcoa A·C·S·R.

Aluminum Company of America
1999L Gulf Bldg. · Pittsburgh 19, Pennsylvania

ALCOA
FIRST IN ALUMINUM
FIRST IN
A·C·S·R
Aluminum Cable Steel Reinforced

FOR WHAT YOU NEED, WHEN YOU NEED IT—CALL WESCO



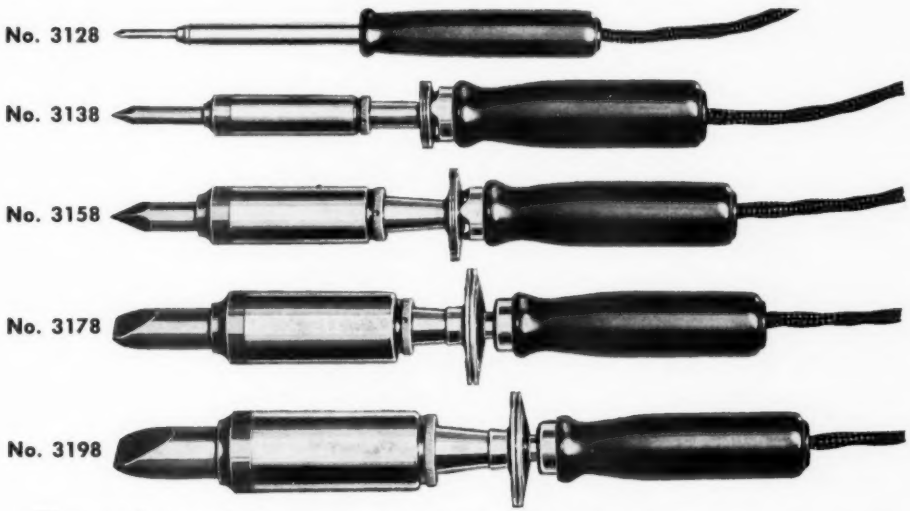
For Durability . . . Dependability . . . Efficiency

American Beauty

ELECTRIC SOLDERING IRONS

EMBODIED in these Electric Soldering Irons are those features of construction and design that specialized experience—since 1894—has demonstrated to be desirable for efficient and lasting service. Hundreds of thousands are in use throughout the world in a wide variety of manufacturing plants; in service, maintenance and repair shops; Army and Navy Services; in telephone, telegraph and radio stations. Because of their proven efficiency and durability, they are preferred by those who measure the value of a tool by the service it renders.

RELATIVE SIZES



American Beauty TEMPERATURE REGULATING STAND

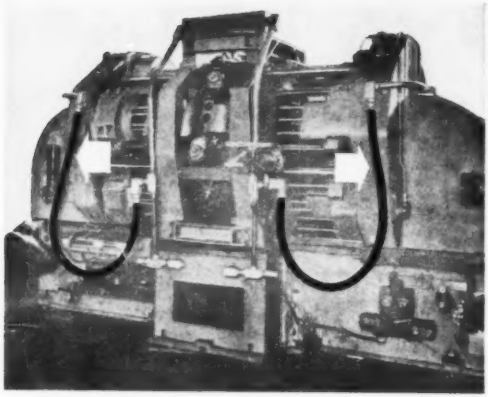
This is a thermostatically controlled device for the regulation of the temperature of an electric soldering iron while at rest. When placed on this stand, soldering iron is maintained at working temperature, ready for instant use or, if desired, at a lower temperature. Through an adjustment on bottom of the stand, thermostat may be set for the maintenance of any desired temperature—from very low, or warm, to full working temperature. Body of stand is of molded plastic. Soldering iron cradle proper is of metal. Stand is equipped with cord and attachment plug-cap for connection to current and with a receptacle for connection of the electric soldering iron. It is designed for use with electric soldering irons up to 660 watts capacity and on circuits up to 240 volts.

Write for descriptive Catalog—Form No. 206-CP AMERICAN ELECTRICAL HEATER CO. Detroit 2, Mich.

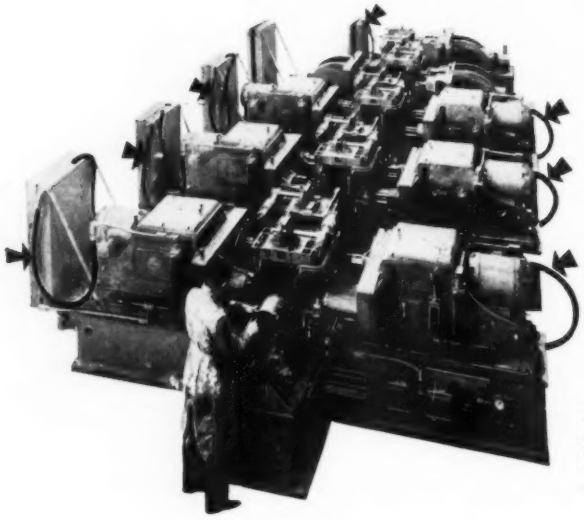
wiring in action

needs

SEALTITE



On this Baush 2-way horizontal transfer machine, Sealtite Flexible Conduit protects the wiring for motor and control circuits from cutting compounds while permitting full trunnion movement.



Sealtite Flexible Conduit protects the power wiring to the motors of the movable heads on each of these 5 Baush horizontal hydraulic transfer machines for drilling automotive transmission cases.

THE working heads of these complex machine tools, which perform a variety of drilling operations on automotive transmission cases, must move out of working position and then return with each operating cycle. Control and power wiring must move with them. To protect that wiring and give it freedom of motion, The Baush Machine Tool Co. of Springfield, Mass. uses Sealtite® Flexible Electrical Conduit.

Sealtite, with its flexible, tough steel core and liquid-tight synthetic jacket, is the ideal conduit wherever motion, vibration, misalignment or short-radius bends are involved . . . where wiring must be protected against liquids, chemicals, oil or grease, fumes, impact or abrasion. You'll find Sealtite not only on machines, but in all types of processing plants and in temporary installations.

Your electrical supply house carries Sealtite in stock. If you would like additional helpful details, just write to The American Brass Company, American Metal Hose Branch, Waterbury 20, Connecticut. In Canada: The Canadian Fairbanks-Morse Company, Ltd.

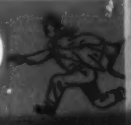
for **flexible, liquid-tight** electrical conduit

specify SEALTITE

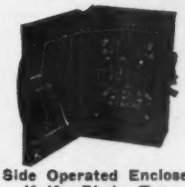
AN ANACONDA® PRODUCT

*Trademark

FOR DELIVERIES TO MEET WORK SCHEDULES—CALL WESCO

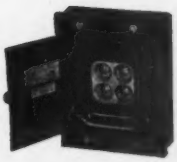


Pullout Type
Main and Range
Combination



Side Operated Enclosed
Knife Blade Type

Front Operated
Toggle Type



Fuse Cabinet

Outdoor—Raintight
Service Switch

The American
ELECTRIC SWITCH CORPORATION
Minerva Ohio.

Sales Office and Factory at Minerva, Ohio

SALES ENGINEERS

Atlanta	Boston	Chicago
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San Francisco	St. Louis	

Write for our latest Catalog

SERVICE ENTRANCE EQUIPMENT

AMERICAN Range Switches—dead front type—115-230 volts—non-interchangeable hot moulded bakelite main and range pull-out heads—taps for hot water and up to 12 fused branch lighting circuits.

AMERICAN General Purpose Switches—side operated—knife blade type—two and three wire—quick break—fused—30 to 1200 amperes.

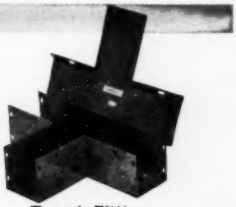
AMERICAN Meter-Switch-Fuse Sequence—front operated—toggle type—30 to 60 amperes—fused—2 to 12 branch circuit fuses—bell ringer transformer space optional.

AMERICAN Fuse Cabinets—Flush and Surface Mounting—2 to 24 circuit, 1 pole plug fuse branches—single phase, 3 wire and three phase 4 wire service.

AMERICAN Outdoor Meter Switches and Devices—side operated—knife blade type—weatherproof—for main line disconnect—standard hubs in top—quick break—fused—125 and 250 volts—2 and 3 poles—30 to 200 amperes.

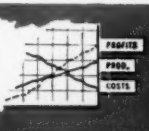
AMERICAN Wiring Trough and Fittings—3 to 8 inches wide—3 to 8 inches deep—hinged or screw cover—trough fittings also are available.

Wiring Trough



Trough Fittings

FOR COURTEOUS, INTELLIGENT SERVICE—CALL WESCO



It's easier to sell the job with

DURASHEATH — *the all-purpose cable*

OVERHEAD

IN DUCTS

IN THE GROUND

You can give your customers a faster—and a better—job when you install their power lines with Durasheath*. Versatile Durasheath can go overhead in ducts and directly into the ground in one continuous run.

Durasheath is designed for power and lighting circuits for industrial plants, mines, airports†, housing developments, stadiums, farms and railroad signal systems.

Durasheath is flexible and easy to handle. Its tough neoprene jacket stubbornly resists electrolysis, corrosion, temperature extremes, cutting, abrasion and impact. It is little affected by flame, oils, moisture, as well as most soil acids and alkalies.

Fully Underwriters' Laboratories approved, Durasheath comes in one, two or three conductors for service from 600 to 5,000 volts. For complete details on Durasheath, just ask your nearest Anaconda Sales Office or Distributor. Anaconda Wire & Cable Company, 25 Broadway, New York 4, New York.

*Trademark

— ***IN ONE CONTINUOUS RUN!***

†When ordered to CAA Specification L-824

the right cable for the job.....ANACONDA®

WIRE AND CABLE

A More Economical Connector...

PATENT APPLIED FOR

Here is a ½", ¾" or 1" thin-wall connector that costs less, installs faster, provides extra wiring room. Eliminates locknuts. Knurled chamfer bites the rim of the knockout to prevent slippage and provide perfect grounding. *Write for Price Sheet TNI-351.*

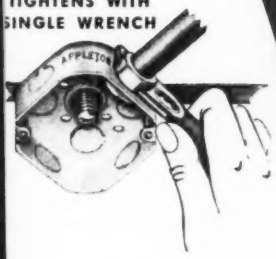
A More Efficient Lighting Fixture...

TWIST—
IT'S ON!

PATENT APPLIED FOR

New "V-51" Series. Never before a vaportight lighting fixture so safe, so efficient, so easy to maintain! Exclusive Unit Assembly makes receptacle, globe and guard instantly detachable for re-lamping, *without tools!* Converts for higher or lower wattage lamps just as easily. Reflector has exclusive neoprene rubber ring mount. *Write for Bulletin 5-A.*

TIGHTENS WITH
SINGLE WRENCH



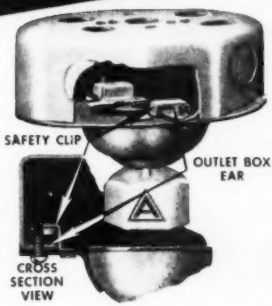
APPLETON ENGINEERING, geared to the ever-growing electrical industry, is continually at work to bring you new products - better products - such as the four recent examples shown here...

A Simpler, Stronger Entrance Fitting...

PATENT APPLIED FOR

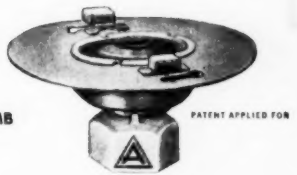
Appleton OF-1 and OF-2 Service Entrance Fittings combine convenience, economy and greater weather protection. Single-piece bodies eliminate need for separate cover on entrance head. No covers to become lost before installation, loosen or dislodge after job is done. *Write for Price Sheet TNI-451.*

A Much Safer Fixture Hanger Cover...



SWIVELS 30° FROM PLUMB

Positive protection against falling! Safety clips automatically position directly above outlet box ears. Permanently joined to the cover, clips will support weight of fixture even if outlet box screws rust through or vibrate out! An exclusive Appleton safety feature. *Write for Price Sheet TNI-551.*



PATENT APPLIED FOR

Sold Through Electrical Wholesalers

APPLETON ELECTRIC COMPANY

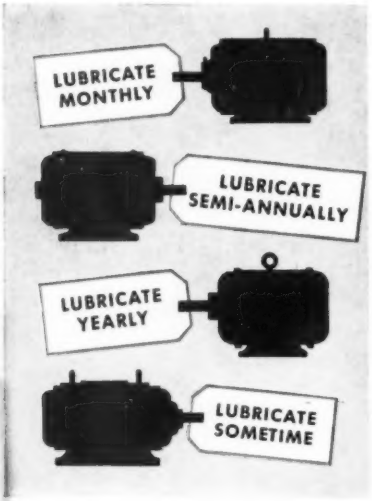
1704 Wellington Avenue • Chicago 13, Illinois

SWITCH BOXES • OUTLET BOXES & COVERS • GROUND FITTINGS
LOCKNUTS & BUSHINGS • COUPLINGS & CONNECTORS (FOR EMT)
REA FITTINGS • SERVICE ENTRANCE FITTINGS & CONNECTORS
BOX CONNECTORS • BAR SETS & HANGERS • OVALTUBE FITTINGS
REELITES—PORTABLE TYPE, CONSTANT DUTY, EXPLOSION-PROOF

YOU NAME IT; WESCO HAS IT OR CAN GET IT

YOU CAN BE **SURE**.. IF IT'S

Westinghouse



Why take a chance with "Once-in-a-while" lubrication?

Why fuss with motors that require lubrication "every so often?" Whether it's monthly, yearly, every two or three years, or just an indefinite "sometime," it is as much trouble remembering when to lubricate, as it is to do the lubricating. And it certainly isn't a very good way of making sure bearings get proper greasing attention.

There *is* one way to be *sure*. That's with Life-Line motors. Lubrication is *positive*. Bearings are pre-lubricated and factory-sealed. *No* further lubrication is required!

This is the modern way of lubricating motors. Development of special lubricants, up-to-date manufacturing methods and special seals have made it possible.

Records of nearly half a million motors, operating in every type of industry, indicate that pre-lubricated bearings offer: an average saving of $2.70 yearly per motor . . . 41% fewer motor outages due to faulty lubrication . . . complete freedom from lubrication attention.

Today, periodic lubrication is a costly nuisance. So why take a chance with it when Life-Line offers positive lubrication at no extra cost. See for yourself. Ask your Westinghouse representative for a copy of "Facts on Pre-Lubricated Bearings," B-4378, or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania.

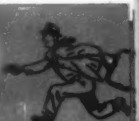
J-21559

—— If you figure LIFE-COSTS . . . you'll figure LIFE-LINE ——

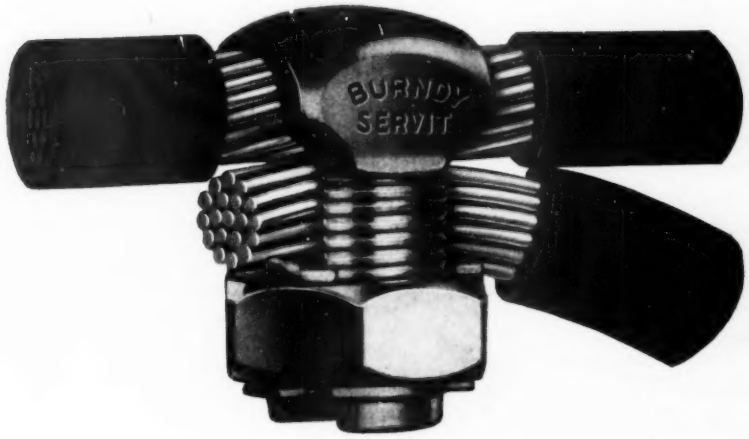
Westinghouse *Life-Line* Motors

INDUSTRY'S LEADING MOTOR

USE THE EXPERIENCE OF TRAINED WESCO MEN



BURNDY-BUILT *to do an important job* BETTER

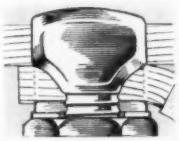


Comparison of Burndy Servit with other makes, reveals some striking advantages. The longer Servit head is easier to hold with a wrench. The pressure bar equals the length of the head and contributes much to Servit's higher pull-out strength. Servit is forged from high-strength silicon bronze alloy to afford exceptional durability without bulk. Furthermore, all Servits will give good results in service. Strict quality control on daily production runs keep Servit performance characteristics at a uniformly high level.

MORE CONVENIENT! — Won't nick up like sore thumb! Easier wrench grip!

SMALLER! — Servit shown against another split-bolt of comparable size.

BURNDY SERVIT



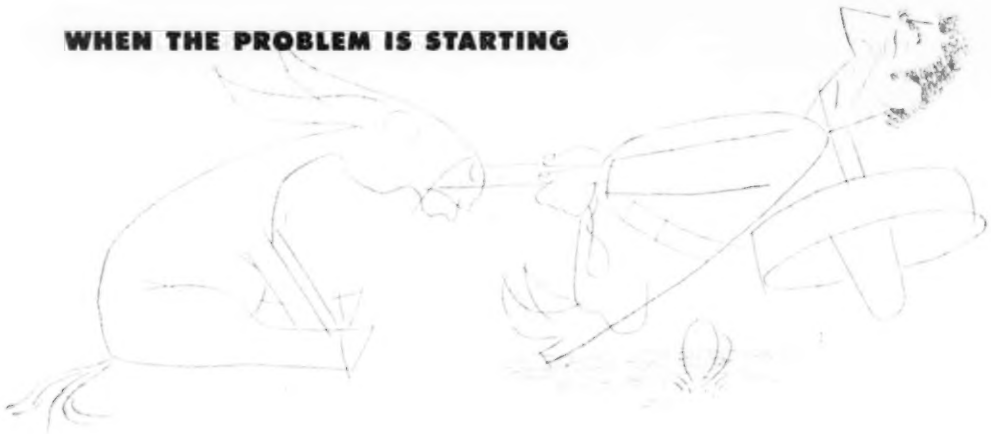
STRONGER! — Head and pressure bar of equal length — bar resists crushing!

TIGHTER! — Maximum tightening force transmitted into intimate contact between conductors.

BURNDY, New York 54, N. Y.
Western Branch: Vernon 58, Calif.
Burndy Canada Ltd., Toronto 8, Ontario

TO HELP YOU ON THE JOB — CALL WESCO
FOR QUALITY ELECTRICAL SUPPLIES AND SERVICE

WHEN THE PROBLEM IS STARTING



THE ANSWER IS BRYANT

Every Bryant Fluorescent Starter is manufactured under the strictest supervision to assure dependable performance and long life. Each starter is:

- **Made from the highest quality materials**
- **Precision assembled to exact specifications**
- **Individually inspected and electrically tested on actual lamp load**

"NO BLINK" TYPES

These starters eliminate blinking and flickering of lamps which have reached the end of their useful life, thereby protecting the ballast and prolonging the life of the starter.

AUTOMATIC RESET

(Restores the circuit as soon as new lamp is inserted.)

Two pin—for 40, 85, 90 and 100 watt lamps.

Four pin—for 85, 90 and 100 watt lamps.

Listed as Standard by Underwriters' Laboratories, Inc.

MANUAL RESET

(Circuit restored by pushing small red button in top of starter, after new lamp has been installed.)

Two pin—for 15, 20, 30 and 40 watt lamps.

Four pin—for 85, 90 and 100 watt lamps.

THE BRYANT ELECTRIC COMPANY

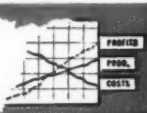
Bridgeport 2, Connecticut

CHICAGO • LOS ANGELES

BRYANT
SUPERIOR WIRING DEVICES

J-99859

FOR WIDE-AWAKE "INSIDE SERVICE"— CALL WESCO



For surest cable protection, specify—

BERMICO®

FIBRE CONDUIT

Scientifically Designed and Constructed to Provide Better Cable Protection, BERMICO *is always on the job!*

1 **LIGHT.** Easily handled on the job; one man can carry several 8-foot lengths at once—lay more per working hour.

2 **TIGHT.** All joints are precision milled for light, speedy, installations.

3 **STRONG.** Bermico Conduit is engineered to take the shocks and stresses of transport . . . the heavy loads imposed during installation.

4 **NO SPLIT COUPLINGS.** With Bermico's specially designed couplings, you end the expense—the loss of time required to replace broken couplings.

5 **WATER PROOF.** Bermico's water absorption factor is extremely low—its insulation factor extremely high, even under toughest conditions.

6 **ACID RESISTANT.** Resistant to soil acids and alkalies, Bermico Conduit is, itself, chemically inert.

7 **SMOOTH INSIDE BORE.** Quick and easy cable "pull throughs"—without danger of abrasions—when you're using Bermico *inspected* conduit!

8 **UNIFORM.** Four rigid factory inspections guarantee Bermico's uniformity of dimensions, specifications and quality.

Production facilities and schedules are geared to assure prompt shipments.

distributed by

WESTINGHOUSE ELECTRIC SUPPLY COMPANY

Offices in all leading cities

BERMICO FIBRE CONDUIT—A PRODUCT OF BROWN COMPANY

Mills—Berlin, N. H.

CRESCENT

ABC ARMORED CABLE

Has These Improved Features Which Make Installation

EASIER—QUICKER—SAFER

Bond Strip Under Armor

Permanently low armor resistance **is provided in sizes No. 14 and 12 AWG by use of a flattened, bonding wire which is in contact with the under side of each convolution.**

Prefabricated Break Lines

The Cut Mark (at 1½" intervals) shows the location of a prefabricated breaking line inside the armor. Only a few strokes of a file or saw guided by the Cut Mark are required to cut through one outer ridge, and a bend by hand severs the armor. This results in a clean separation with no sharp edge—a safer, easier and faster job. The prefabricated breaking lines are so designed that there is *no reduction* in tensile strength, bending quality, crushing resistance and electrical conductivity of armor.

FILE OR SAW

BREAK

PULL OUT PAPER

INSERT BUSHING

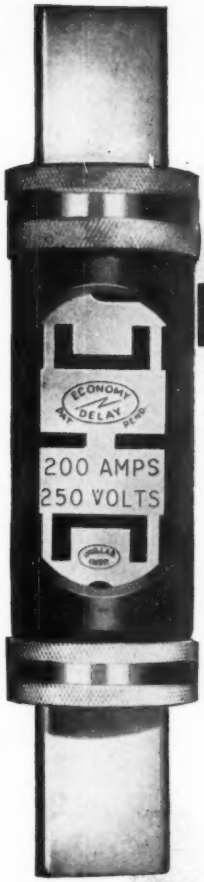
The finest product plus WESCO service means satisfaction always.

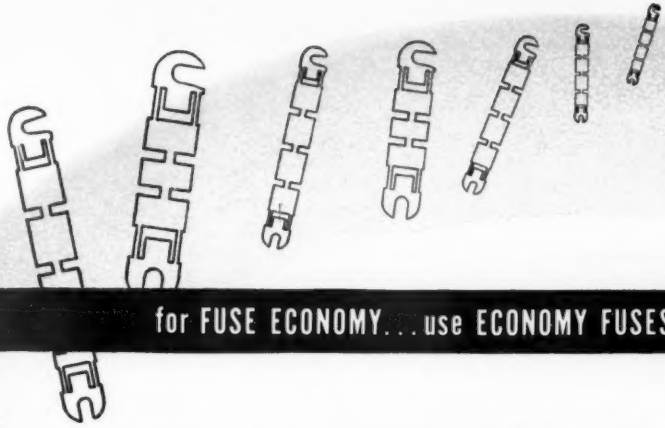
CRESCENT WIRE & CABLE

CRESCENT INSULATED WIRE & CABLE CO.

TRENTON, N. J.

FOR WHAT YOU NEED, WHEN YOU NEED IT—CALL WESCO





for FUSE ECONOMY... use ECONOMY FUSES

SUREST protection at LOWEST cost

...and CONSERVES *precious Brass and Copper*

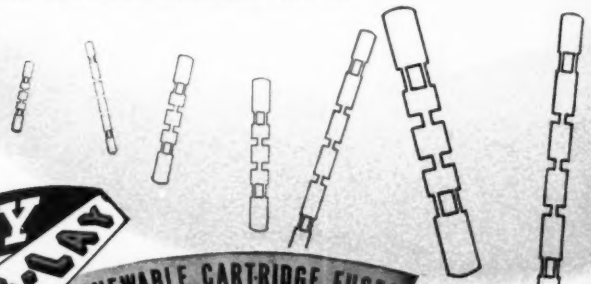
Your first investment in a metal-conserving "ECONOMY DE-LAY" Renewable Fuse is reasonable—and you save a lot of money every time you have a "blow". Because you simply remove the blown link and replace it with a new, inexpensive "ECONOMY DE-LAY" Renewal Link in the same cartridge.

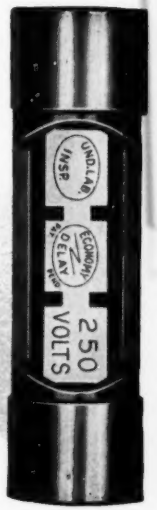
This restores the fuse to its original efficiency, at a cost of only a few cents for each "blow".

You can't buy any other type of fuse protection that "serves" you so well, and costs so little.

Your Electrical Wholesaler has "ECONOMY DE-LAY" Renewable Fuses and Renewal Links in stock.

Ask for the ECONOMY *Catalog and Price List.*





ECONOMY DE-LAY RENEWABLE CARTRIDGE FUSES

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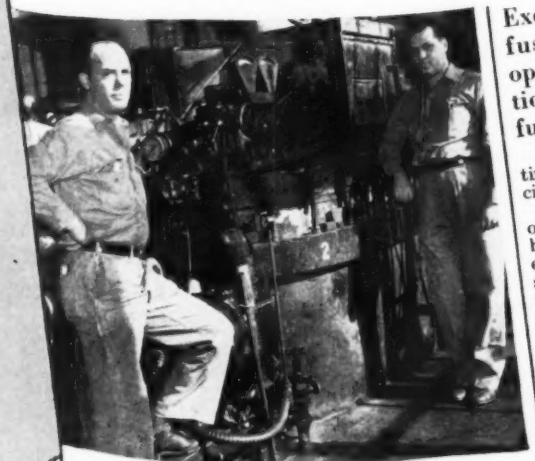
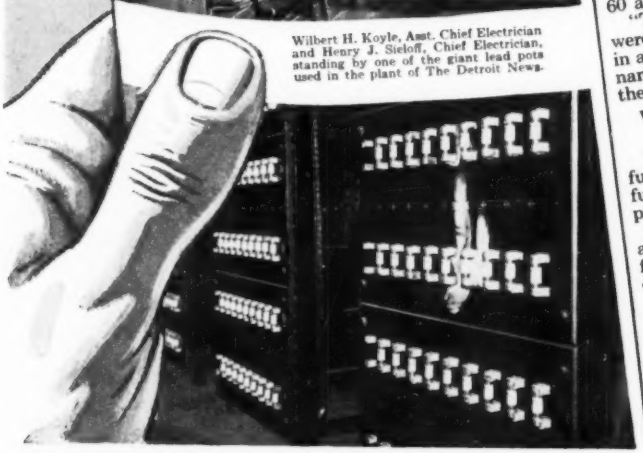
The Detroit News
EWSPAPER FOR MORE THAN 77 YEARS
ree Weekday and Sunday, of Any Michigan Newspaper

FUSE FAILURES ON LEAD POT CIRCUITS STOPPED COLD — BY CHANGING TO FUSETRON FUSES



Wilbert H. Koyle, Asst. Chief Electrician and Henry J. Sieloff, Chief Electrician, standing by one of the giant lead pots used in the plant of The Detroit News.



Excessive heating of ordinary fuses caused 3 to 4 fuses to open every week. Cooler operation of Fusetron dual-element fuses cured trouble completely

"Prior to May 20, 1950, we had a bad time keeping all the electric heating circuits on our lead pots in full operation.

"We have two eight-ton lead pots and one six-ton. Each is electrically heated by single phase, 220 volt, 10 kilowatt elements, fed from a 220 volt, 3 phase source. The circuits on each are protected by sixty 60 ampere and nine 400 ampere, 250 volt fuses.

FOUND 6 TO 8 FUSES BLOWN

"To be sure that all heating elements were operating properly, we used to check all 207 fuses about once in two weeks. Generally our maintenance electrician would find six to eight of the 60 ampere fuses open.

"This meant that our melting pots were not operating at full efficiency and in addition to this loss, our fuse maintenance and purchases were greater than they should be.

WITH FUSETRON FUSES NOT ONE OUTAGE

"As an experiment, we changed all fuses over to FUSETRON dual-element fuses of the same amperages as had been previously used.

"To date, March 9, 1951, or after about nine months of using Fusetron fuses, our records show that not one of them has failed.

"We attribute this remarkable result to the lower resistance of Fusetron fuses which allows them to operate at a cooler temperature than other fuses that we have used."

Henry Sieloff, Chief Electrician
The Detroit News, Detroit, Mich.

FOR DELIVERIES TO MEET WORK SCHEDULES — CALL WESCO

Fuses that Protect in 10 Ways now Available

Fusetron dual-element fuses offer user surprising advantages

1. *Protect against short circuits.
2. Protect against needless blows caused by harmless overloads.
3. Protect against needless blows caused by excessive heating — lesser resistance results in much cooler operation.
4. Provide thermal protection — for panels and switches against damage from heating due to poor contact.
5. Protect motors against burnout from overloading.
6. Protect motors against burnout due to single phasing.
7. Give DOUBLE burnout protection to large motors — without extra cost.
8. Make protection of small motors simple and inexspensive.
9. Protect against waste of space and money — permit use of proper size switches and panels.
10. Protect coils, transformers and solenoids against burnout.

★Fusetron Fuses have high interrupting capacity as shown by tests of the Electrical Testing Laboratories of New York City in December 1947.

Details on the Fusetron dual-element Fuse

A fuse link combined with a thermal cut-out — the result, a fuse with tremendous time-lag and much less electrical resistance.

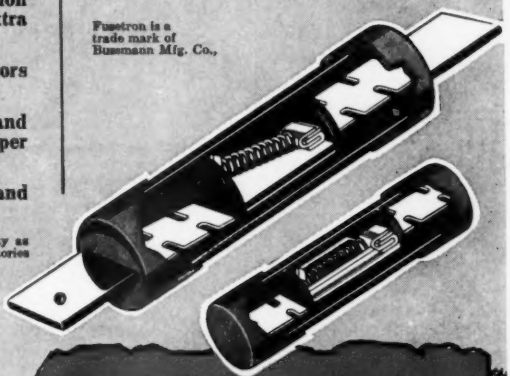
They have the same degree of Underwriters' Laboratories approval for both motor-running and circuit protection as the most expensive devices made.

Made to same dimensions as ordinary fuses, FUSETRON Fuses fit all standard fuse holders.

Obtainable in all sizes from 1/10 to 600 ampere, both 250 and 600 volt types. Also in plug types for 125 volt circuits.

Their cost is surprisingly low.

Fusetron is a trade mark of Bussmann Mfg. Co.,



Don't risk losses in your plant!

One **needless** shut-down,
One **lost** motor,
One **destroyed** panel or switch,
One **burned out** solenoid . . .
May cost you more than replacing every ordinary fuse with a FUSETRON dual-element fuse.

Bussmann Mfg. Co.,
University at Jefferson, St. Louis 7, Mo.
(Division of McGraw Electric Co.)

Please send me complete facts about FUSETRON dual-element Fuses.

Name.....

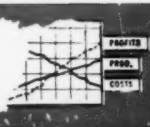
Title.....

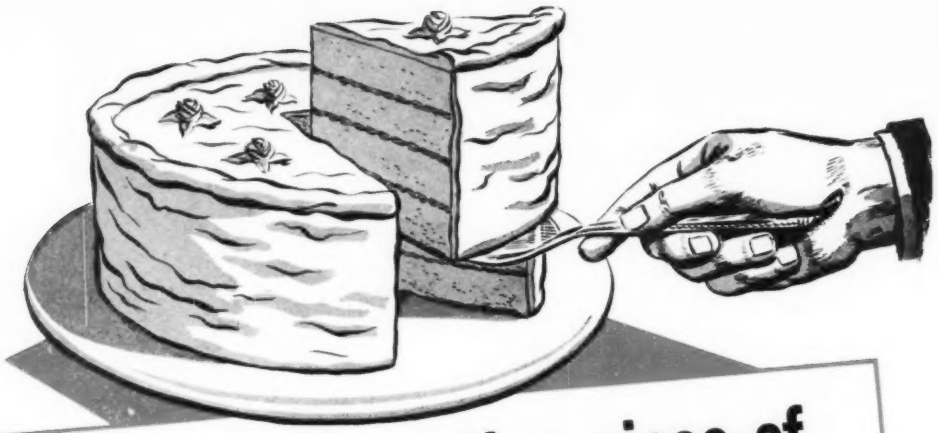
Company.....

Address.....

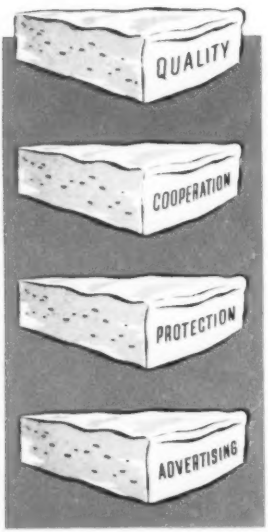
City.....State.....BCM 11-48

FOR COURTEOUS, INTELLIGENT SERVICE — CALL WESCO





Cut yourself another piece of EDWARDS famous 4-layer cake



QUALITY PRODUCTS Since 1872, Edwards has pioneered in the development of precision-built Electrical Signaling, Communication and Protection Equipment for Schools, Hospitals, Industry, Offices and Homes.

COOPERATION WITH CONTRACTORS All Edwards equipment is designed for easy, economical installation and maintenance. Edwards gives full cooperation and helpful service to the electric contractor.

DISTRIBUTOR PROTECTION All Edwards business goes through the distributor, who renders an indispensible service to contractors and users in the sale of Edwards staples. The distributor is further rewarded because he also profits from the systems business developed by Edwards.

NATIONAL ADVERTISING Edwards month after month advertising in leading national publications reaches *important* prospects in major markets . . . builds business for distributors and contractors not only for systems but for staples as well.

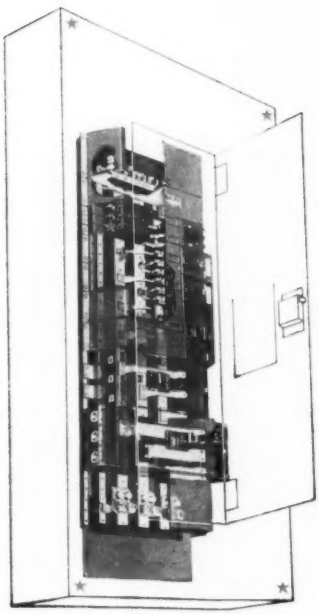
EDWARDS

World's most reliable time, communication and protection products.

EDWARDS Co., Inc., Norwalk, Conn. In Canada: Edwards of Canada, Ltd.

PRODUCTION CHANGE-OVER TIME WON'T MELT AWAY WITH . . .

Screwdriver Convertibility



Outmoded circuit protection and slow change-over can inflict double penalty on production schedules today.

It's easy to make necessary circuit changes on the job with Westinghouse Circuit Breaker Panelboards—safely, quickly.

First, indicating trim clamps make it easy to get the trim off. Since change-over parts are die-dentical, a precise fit is insured. Pretapped busbars and back pans eliminate any necessity for drilling, tapping or machining.

Screw driver convertibility is a feature of the big Westinghouse Nofuze® Convertible Distribution Panelboard, but is also available in all Westinghouse "De-ion®" Panelboards.

For complete information call your Westinghouse representative, or write for DB-30-930 containing complete data on Westinghouse Lighting and Distribution Panelboards, Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Penna.

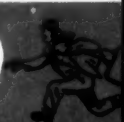
J-93467

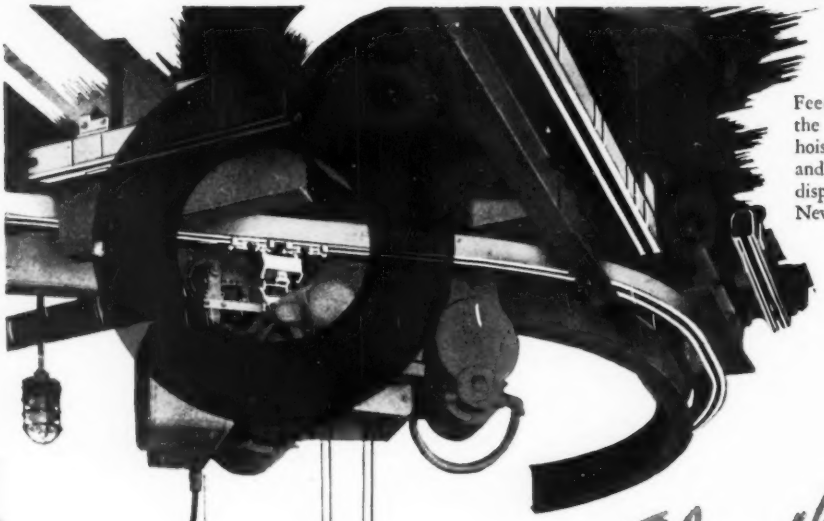
YOU CAN BE **SURE**.. IF IT'S

Westinghouse

PANELBOARDS

YOU NAME IT; WESCO HAS IT OR CAN GET IT

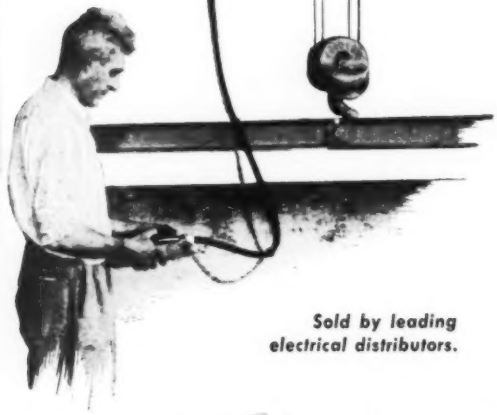




Feedrail system provides the power for a monorail hoist with slide switches and turntable in a sewerage disposal plant in Brooklyn, New York.

ELECTRIC FEEDRAIL *Flexibility*

Simplifies Plant Problems



Sold by leading electrical distributors.

Feedrail is a flexible system of electrical distribution. It powers small or large hoists with equal ease. Mobile power trolley outlets supply power to crane or hoist. It's a simple problem to power a hoist on a curve, slide switch, transfer, turntable or spur run. Easily and quickly installed it provides a safe, dependable power source and requires little or no mainteance.

Feedrail offers new freedom in planning plant layout and production schedules. Trolleys roll smoothly within the enclosed track and current is immediately available where needed. Trolleys are added in a matter of minutes without shutting off the power.

Unit powered equipment and men move into line at a moment's notice to break "bottlenecks" at overloaded work centers. This flexibility is a vital factor in lowering costs and raising production volume. A factory fabricated Feedrail system will solve your electric power distribution problems. Write for literature.

46-D

Never Becomes Obsolete

ELECTRIC FEEDRAIL®

FEEDRAIL CORPORATION

Subsidiary of Russell & Stoll Company, Inc.

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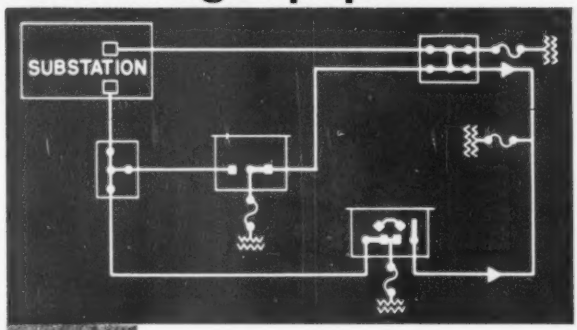
USE THE EXPERIENCE OF TRAINED WESCO MEN

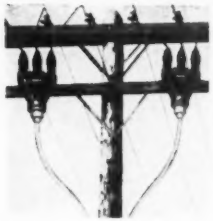
For FLEXIBILITY in UNDERGROUND SYSTEMS
Use G&W Sectionalizing Equipment

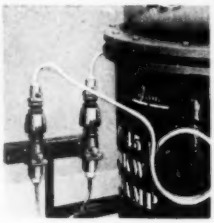
As the trend in electrical distribution has turned toward the use of underground cable systems, G & W Electric Specialty Co. has pioneered in the design of devices for terminating, connecting, fusing, and switching cables.

At the right is a composite diagram of a cable system showing how G & W equipment provides system flexibility with minimum expense for equipment.

When you are designing a primary cable system, consult G & W or the G & W engineering representative near you. Let us show you how disconnecting potheads, oil fuse cutouts, cable boxes, and oil switches can help you obtain maximum efficiency at minimum cost.

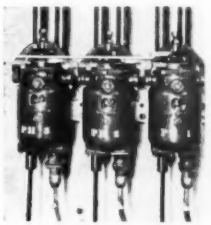


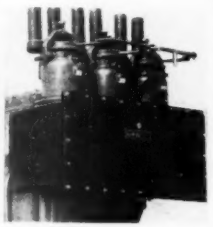




CABLE CONNECTION BOXES

Air or oil filled boxes with links or fuses are widely used for sectionalizing underground cables. Where operation is infrequent and time of operation is not important, G & W cable boxes are the most economical means of interconnecting feeders and isolating equipment.



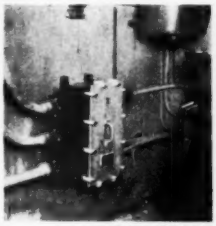


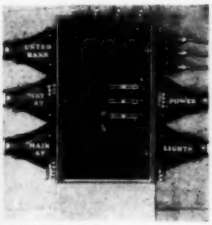
LOAD BREAK OIL SWITCHES

Where rapid, safe sectionalization of feeders and isolation of equipment is required, G & W load break oil switches are installed. 7500, 15,000, and 23,000 volt switches are made in any switching arrangement necessary to meet individual requirements. Type "RA" load break oil switches provide maximum system flexibility in any installation.

DISCONNECTING POTHEADS

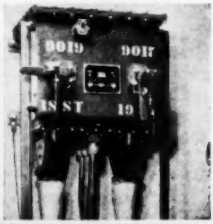
These hermetically sealed cable terminations provide a convenient and economical means for disconnecting cables from overhead wires or isolating equipment from feeders. Plug and socket porcelain enclosed disconnects provide non-load break disconnection up to 7500 volts.





OIL FUSE CUTOUTS

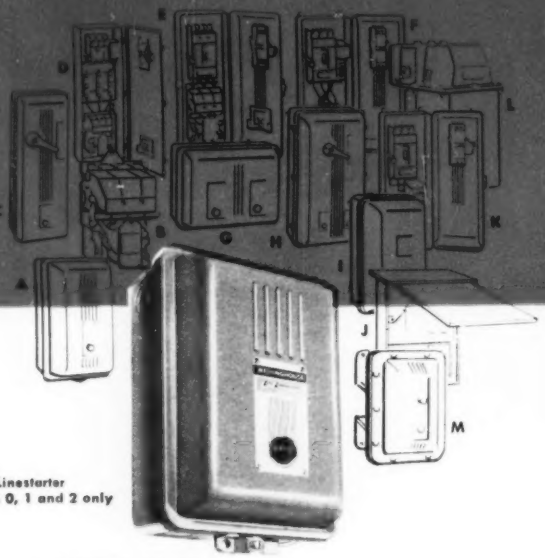
Actually load break oil switches enclosed in a common steel housing with oil immersed fuses, oil fuse cutouts are used for fusing and switching primary circuits in subway, vault, and overhead installations. Within the limits of their short circuit interrupting capacity, 2500, 5000, and 8000 volt units can often be used where more expensive protection equipment would otherwise be required.



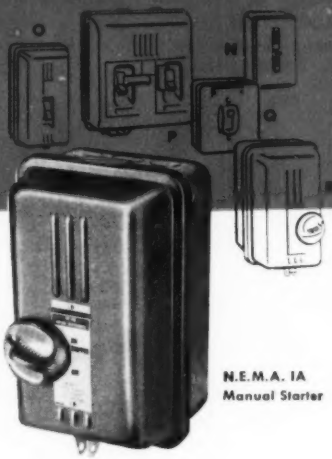
G&W ELECTRIC SPECIALTY COMPANY
7780 DANTE AVENUE • CHICAGO 19, ILLINOIS, U.S.A.
Representatives in principal cities. In Canada, Powerlite Devices, Ltd., Toronto

TO HELP YOU ON THE JOB—CALL WESCO
FOR QUALITY ELECTRICAL SUPPLIES AND SERVICE

THE MOST COMPLETE LINE OF MOTOR CONTROLS IN INDUSTRY



Life-Linestarter
Sizes 0, 1 and 2 only



N.E.M.A. 1A
Manual Starter

MAGNETIC CONTROLS

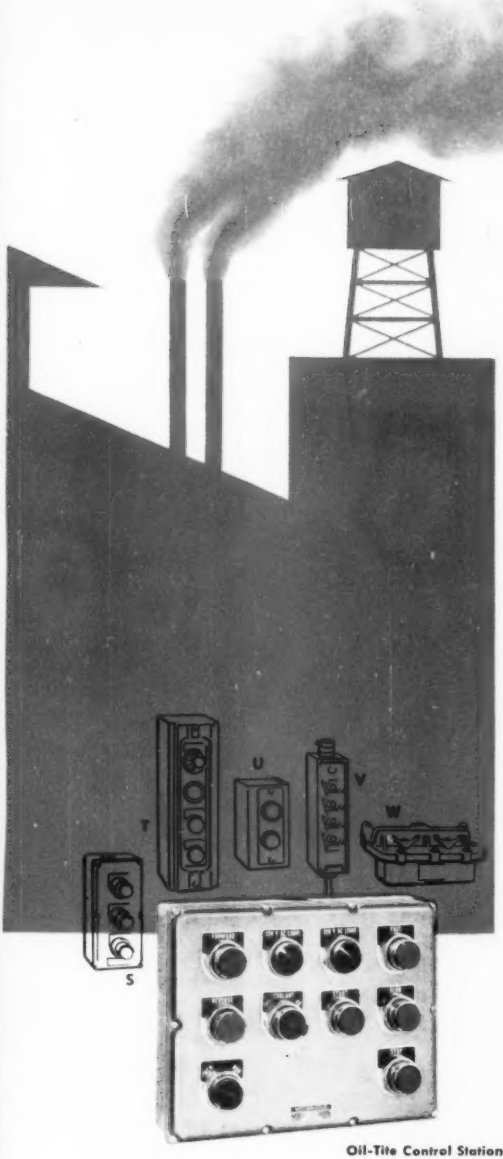
A Life-Linestarters **B** Open Life-Linestarters and Contactors **C** Plain Disconnect Combinations **D** Fusible Combinations **E** AB Breaker Combinations **F** J. I. C. Life-Linestarters **G** Reversing Life-Linestarters **H** Fusible or Breaker Combination Reversing Life-Linestarters **I** Multi-Pole Contactors (Relays) **J** Oil-Well Pumping Controls **K** Cotton Card Controls **L** Oil-Immersed Linestarters **M** Cast-Iron Enclosures for Starters

MANUAL CONTROLS

N Motor Sentinels* (also available with indicating light)
O Motor Watchmans®
P Reversing Motor Watchmans
Q Motor Snap Switches
R N.E.M.A. 1A Manual Starters

*T. M.

FOR WIDE-AWAKE "INSIDE SERVICE"— CALL WESCO



Oil-Tite Control Station

CONTROL STATIONS

S Oil-Tite® Control Stations
T Heavy-Duty Pushbuttons
U Standard-Duty Pushbuttons
V Pendent Pushbuttons
W Oil-Immersed Pushbuttons

For the Control and Protection of Any Motor

Why dull the edge of full-tilt production with faulty motor control? To give you better motor protection, more production protection, Westinghouse offers the most complete line of manual and magnetic motor controls in industry today.

A complete line of control with all N. E. M. A. enclosures is available to meet every type of operating condition. Whether for tough or unusual applications, Westinghouse Controls can do the job better. On problem after problem, our top design engineers have perfected and built special equipment to solve the specific problems of such industries as machine tool, automotive, steel, textile, petroleum, chemical and mining.

For product data or for application and engineering service on any problem, call your Westinghouse representative, or write direct to Westinghouse Electric Corporation, Box 868, Pittsburgh 30, Pa.

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Westinghouse
CONTROL

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FOR QUALITY ELECTRICAL SUPPLIES AND SERVICE.

"A Job Well Done Satisfies Everyone!"
The Electrical Contractor
"I'm satisfied—I can depend on the materials I used on that job—General Cable wire and cables throughout."
The Journeyman Electrician
"I'm satisfied—that job was done *right*. It's a lot easier to do good work when you use the best in wire and cable—that's General Cable."
The Owner (He paid for the Job)
"I'm satisfied—not a bit of electrical trouble since the job was done. Everything is running smoothly. I'll want the same combination on my next wiring job."
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"More Power to You"
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Take Your Choice

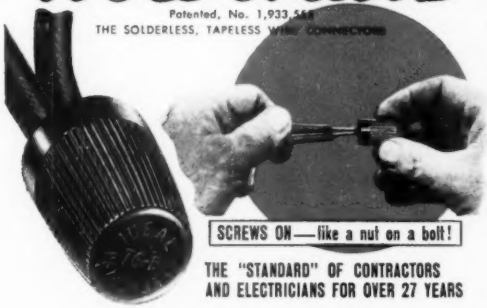
Now 2 Lifetime Wire Connectors by IDEAL

Both • FULLY APPROVED • THE FINEST OF THEIR KINDS EVER MADE

IDEAL Wire-Nuts®

Patented, No. 1,933,545

THE SOLDERLESS, TAPELESS WIRE CONNECTORS



SCREWS ON—like a nut on a bolt!

THE "STANDARD" OF CONTRACTORS AND ELECTRICIANS FOR OVER 27 YEARS

You can do *any* wiring job easier when you make splices with IDEAL "Wire-Nuts"! They're the world's most widely used wire connector — performance-proved by the hundreds of millions in use. Listed by Underwriters' for all types of branch circuit wiring and as pressure cable connectors for general use—with conduit, armored cable, non-metallic sheathed cable and open wiring. . . . *NO SOLDER, TAPE OR TOOLS!* Just screwing on "Wire-Nuts" causes the spring insert to twist, thread and hold the wire ends in a grip that never lets go—that's as strong as the wire itself. Perfectly insulated, too. For all usual wire combinations.

THE NEW IDEAL Set Screw WIRE CONNECTOR

APPROVED FOR 600 VOLTS and as pressure cable connectors. Longest skirt and heaviest shell ever used in this type of connector guarantee extra safe pigtail splices—in branch circuit wiring, machine and appliance hook up. No danger of flash-over with high voltages—actually withstands 8000 volt dielectric and air gap tests. . . . Easy to change circuits — just unscrew and re-use the same connector. Corrosion-resistant — shake-proof and pull proof. IDEAL Set-Screw Connectors are built to be safe on the job for a lifetime. For all usual wire combinations.

No Solder, Tape or Special Tools

Makes perfect joints in just a few seconds that can be visually inspected at any time.

DO THE JOB FASTER WITH IDEAL WIRING TOOLS

Fish Tape, Reel and Puller

Three tools in one. Big, sure grip makes fishing easy through long conduits. SAFE — tape is always in reel or conduit — can't spring loose. 5 sizes—50 to 200 feet.

Voltage Tester

Double protection —solenoid indicator that actually indicates nominal line voltages and an independent neon test lamp. Dependable — extra features for your safety.

"E-Z" Stripper

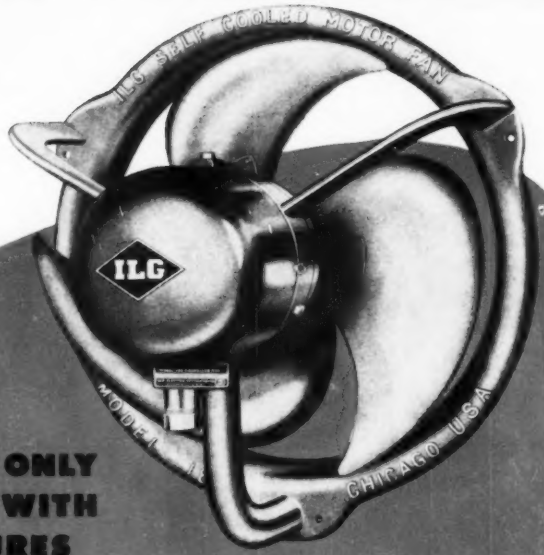
Heavy-duty, all steel — with automatic stop to prevent crushing stranded wire. Speeds stripping, prevents damage to wire. For all wire gauges 8 to 30.

Other Ideal Wiring Tools Include . . .

B-X CABLE CUTTERS — JOIST BORERS — FUSE CLIP CLAMPS — FUSE REDUCERS — FUSE PULLERS AND MANY OTHERS

IDEAL INDUSTRIES, Inc. SYCAMORE, ILLINOIS

How to reduce building costs



WORLD'S ONLY VENTILATING FAN WITH ALL THESE FEATURES

PATENTED SELF-COOLED MOTOR—keeps clean, keeps cool—specifically designed for exhaust fan duty—no foul air reaches it to interrupt service, shorten its life.

DIRECT-CONNECTION—fan wheel mounted directly onto motor shaft for permanent alignment. No noise, cost, or troubles of belts and pulleys.

PATENTED FAN WHEEL—scientifically designed, dynamically balanced to exhaust a greater volume of air quietly, more efficiently.

RUGGED FRAME—with streamlined inlet surface to accelerate rapid flow of air. Rigid and substantial.

"ONE-NAME-PLATE" GUARANTEE—one responsibility covers each propeller fan as a unit.

NAFM AND PFMA RATING LABELS—assure correct ratings covering air capacity and horsepower of each fan.

ILG
REG U S PAT OFF

...with ILG "sensible" ventilation

VENTILATION

● Skyrocketing building costs have forced architects, engineers, contractors and owners to seek new developments, new methods to offset this alarming trend.

Old-fashioned ideas and habitual practices are being tossed overboard in efforts to erect suitable buildings below established price ceilings.

One of the luxuries taking a solid rap these days is elaborate layout of heating and ventilating systems. Many engineers are turning from complicated systems to simple, effective propeller fans for ventilation, unit heaters for heating. They realize complex systems consume quantities of critical materials, are expensive to buy and install, and increase horsepower requirements.

ILG "sensible" ventilation used in connection with most air conditioning systems will reflect a saving where adequate ventilation only is required for portions of the building areas.

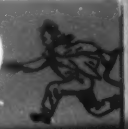
Quiet, powerful ILG Propeller Fans are easy to install in walls, windows, or in penthouses on the roof. They move large quantities of air effectively, with low horsepower requirement. In most cases, there are no "extras" to buy.

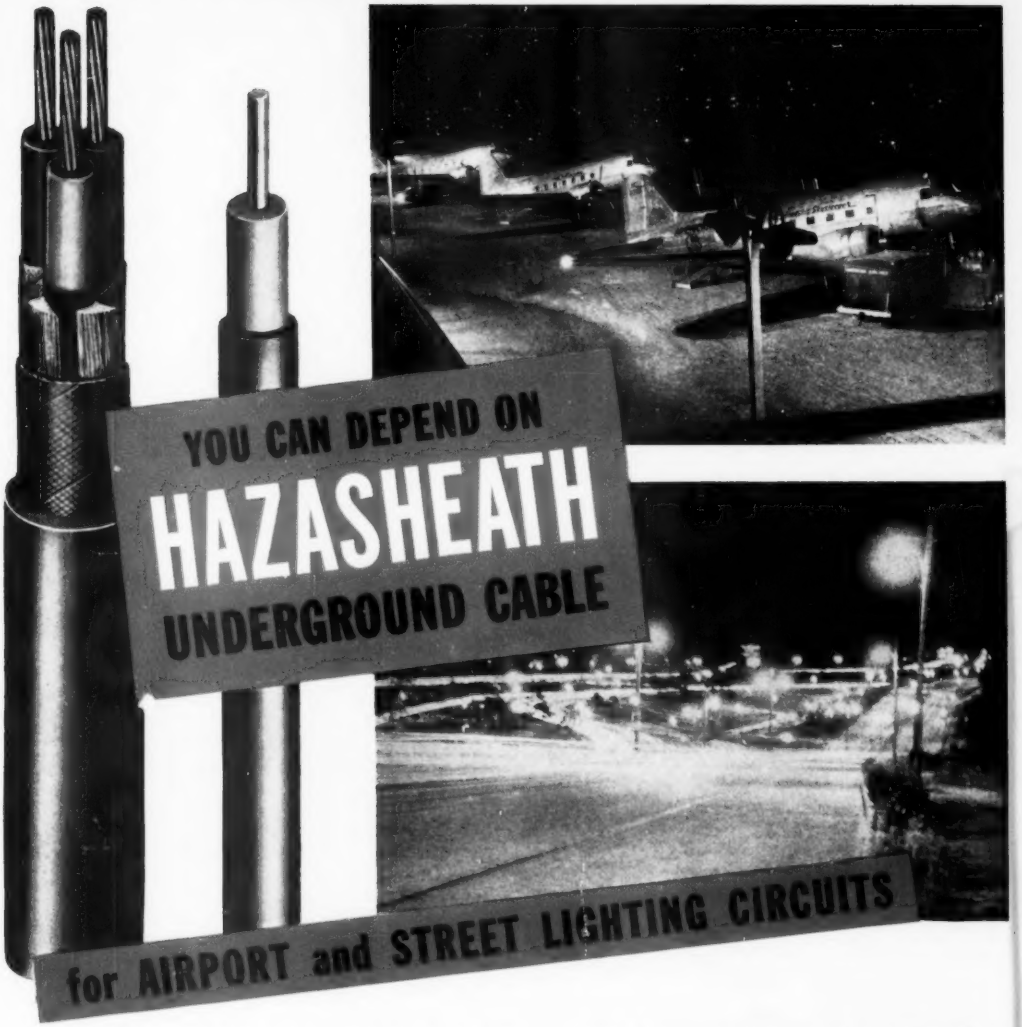
It has also been found that ample supplies of fresh heated air can be introduced with a minimum of cost through a combination of propeller fans and unit heaters.

For help on reducing building costs with some of these proved ideas and modern methods, phone nearby Branch Office (consult classified directory) or write us about your problems to get an expert analysis and recommendations.

ILG ELECTRIC VENTILATING CO., 2879 North Crawford Ave., Chicago 41, Illinois • Offices in more than 40 Principal Cities

FOR DELIVERIES TO MEET WORK SCHEDULES—CALL WESCO





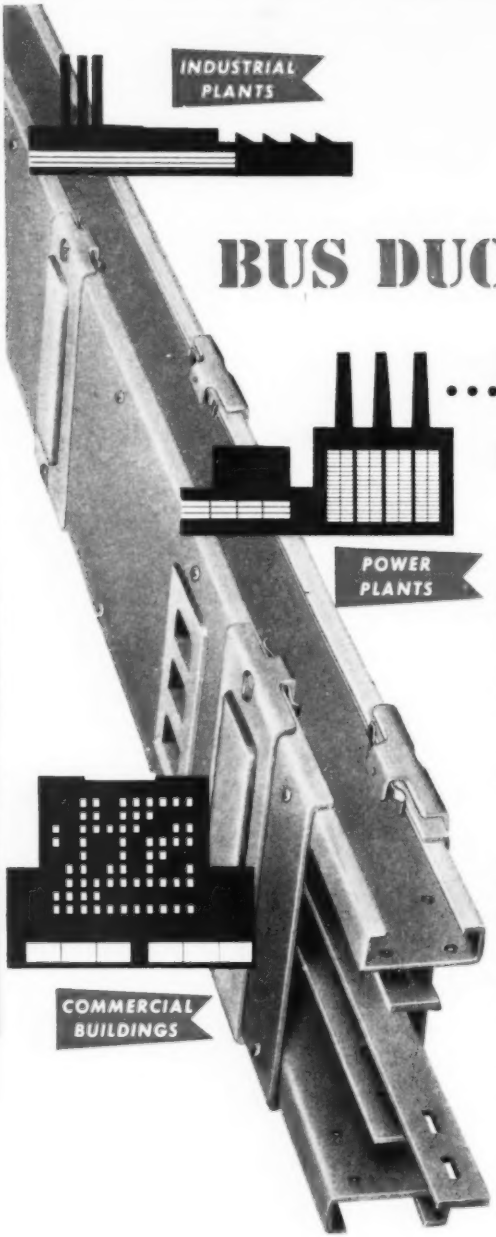
Cable dependability is essential in airport and street lighting circuits. In addition to the danger to aircraft and automobile traffic, cable failure means great expense for repair or replacement. Underground, cable must be dependable to be economical... and here's where Hazasheath performance pays off.

Top quality materials plus simplicity of construction combine to provide Hazasheath's long-lived reliability. Hazard Watertite insulation, a rich rubber compound designed for superior moisture and heat resistance, maintains its excellent electrical and mechanical properties even after years of continuous immersion in water. The Hazaprene sheath, vulcanized under heavy pressure in a metal mold, adds a tire-tough covering to withstand chemically and physically all the rigors of underground service.

Hazasheath Underground Cable, Type RR, has the approval of the Civil Aeronautics Authority for airport lighting systems. When planning any type of underground installation, investigate the advantages of Hazasheath. Ask your Hazard or Wesco Representative for full information or write to the Hazard Insulated Wire Works, Division of The Okonite Company, Wilkes-Barre, Pennsylvania.

HAZARD Insulated wires and cables for every electrical use

FOR COURTEOUS, INTELLIGENT SERVICE—CALL WESCO



BUS DUCT IS FLEXIBLE

...More power capacity at lower installed cost

Laying out new secondary power distribution systems? Expanding production line requirements? Do it more quickly, more economically, provide more flexibility for future change-overs—with Westinghouse Bus Duct.

First, Westinghouse Duct provides more power with less equipment—up to one-third less—than any comparably rated system of wireway, cable or conduit.

Second, Westinghouse Plug-In Duct is safer. Prestite insulators, impervious to moisture and of high mechanical strength, support the busbars, preventing accidental contact with live parts.

Third, Westinghouse Duct minimizes down time, cuts total installed cost at original installation, and during change-over or expansion. Sections of duct, completely prefabricated, are quickly and easily mounted.

Fourth, Westinghouse Duct is designed for virtually any type of building, and for any load requirement. For light loads, use Plug-In Duct. For high capacity use Low-Impedance Duct.

For complete information, call your Westinghouse representative or write for Manual B-4272-A, Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa.

J-30059

DESIGN TESTED AND VERIFIED IN THE Westinghouse HIGH POWER LABORATORY

YOU CAN BE SURE.. IF IT'S Westinghouse BUS DUCT

BUY FROM COMPLETE STOCKS—CALL WESCO FOR QUALITY ELECTRICAL SUPPLIES AND SERVICE

PREFERRED BY LEADING ELECTRICAL MEN

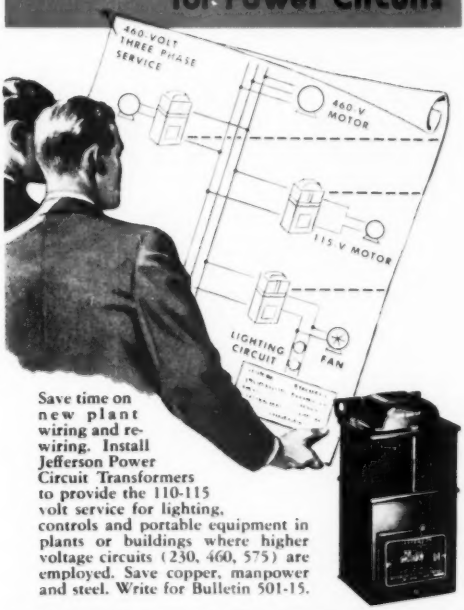
JEFFERSON

TRANSFORMERS—for Mercury Vapor Lamps

Types are available for indoor or outdoor lighting and multiple or series circuit street lighting . . . Designed and manufactured by transformer specialists with over 35 years continuous experience . . . Engineered to coordinate exactly with specifications of the lamp manufacturers . . . Assurance of correct starting and operating performance for long-life, high efficiency lamp operation.

Single and two-lamp—normal and high power factor—transformers. Plus and minus taps are provided on the primary side to permit exact matching to the line voltage. A design for every installation whether Indoors or Outdoors. Complete details in new catalog 521-5.

TRANSFORMERS—Dry Type for Power Circuits



Save time on new plant wiring and re-wiring. Install Jefferson Power Circuit Transformers to provide the 110-115 volt service for lighting, controls and portable equipment in plants or buildings where higher voltage circuits (230, 460, 575) are employed. Save copper, manpower and steel. Write for Bulletin 501-15.

BALLASTS—for Fluorescent Lamps

The latest addition to the complete line of Ballasts available for all lamp types.

The New Jefferson Series Sequence Ballast for two 96T12 Lamps is compact, lighter weight, quiet, and cool operating. POSITIVE STARTING *even at voltages as low as 106 volts—with no detrimental effect to lamp life.*

Maximum wattage is delivered to both lamps, and ballast operating temperature is held to a minimum. The new 430 M.A. Ballast is No. 254-511, certified by E.T.L. and meets all requirements of the proposed American Standard Association Test Specification C82.1 and amendments.

TRANSFORMERS—for Bell and Chime Operation

The *ONE* Jefferson Universal-Mounting WIZARD Bell Transformer for operation of door bells, buzzers, annunciators and door openers replaces THREE models. The patented mounting feature for clamping to the edge of a knock-out provides for installation on an outlet box or cover or cabinet—mounting feet make surface mounting feasible. Chime transformers with greater voltampere capacity and with the same constructional features are also available.

FUSES—All Types

- THERMAL,—SAF-T-LAG
- RENEWABLE,—SUPER-LAG
- RENEWABLE,—JEFFERSON-UNION
- NON-RENEWABLE
- FUSTATS
- PLUG FUSES

Select the type for your particular needs

The Jefferson *SAF-T-LAG* is a heavy-duty Thermal Non-Renewable Fuse with an extra *Safe-Time-Lag* to protect equipment and machinery,—it acts positively on dangerous overloads yet prevents premature and unnecessary blowing on harmless, temporary overloads. The copper elements used have much lower resistance than conventional zinc elements providing 50% lower watt loss and cooler operation.

Jefferson *SUPER-LAG Renewable Fuses* with the long time lag for motor loads and *UNION Renewable Fuses* for circuits where voltage surges are not a factor. A minimum number of parts permits quick and easy renewal.

Where overloads are not a frequent occurrence, as for lighting circuits, the Jefferson *Non-Renewable Fuse* is the choice for economical, dependable service.

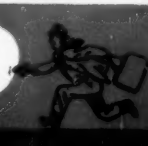
The Jefferson *Fustat* prevents tampering or over-fusing. It has a built-in *thermal cutout* which provides a *long time lag.* Made in capacities of .3 to 30 amperes, for 115-volt circuits.

Plug Fuses, well-made of strong molded insulation,—3 to 30 amperes, for 115-volt circuits.

JEFFERSON ELECTRIC COMPANY, Bellwood, Illinois

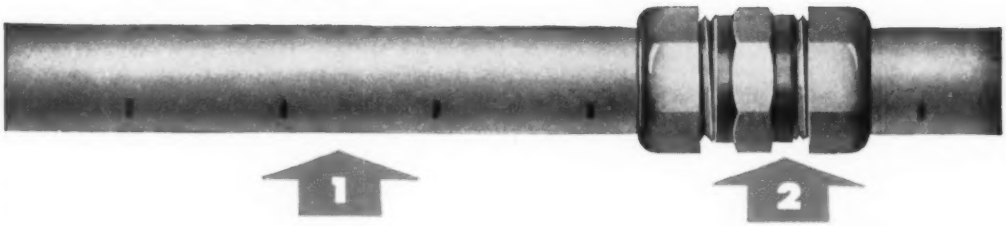
In Canada: Canadian Jefferson Electric Co., Ltd., 384 Pape Avenue, Toronto, Ontario

YOU NAME IT; WESCO HAS IT OR CAN GET IT



Republic ELECTRUNITE

Help Speed Industrial

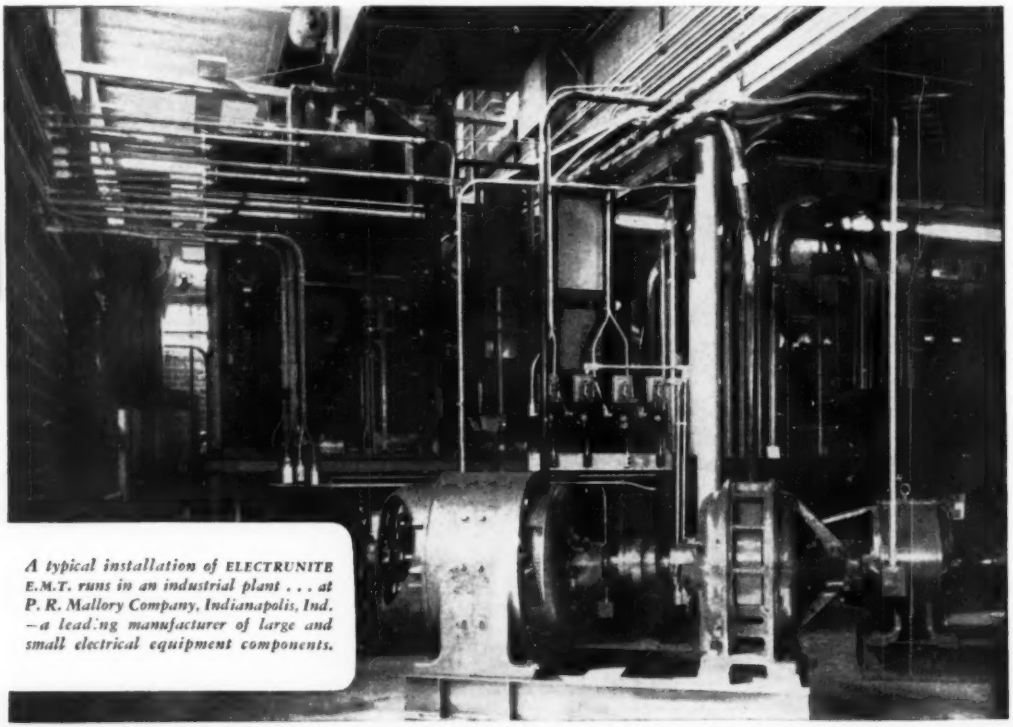


ELECTRUNITE IS EASY TO HANDLE

Less than half the weight of bulky conduit makes ELECTRUNITE E.M.T. twice as easy to carry and handle—far easier to install in troublesome places.

IT'S THREADLESS—THRIFTY WITH TIME

No pipe vise, no threading tools needed with *modern* ELECTRUNITE E.M.T.! Ordinary tools are all that experienced electricians need to make strong, concrete-tight joints *every time*.

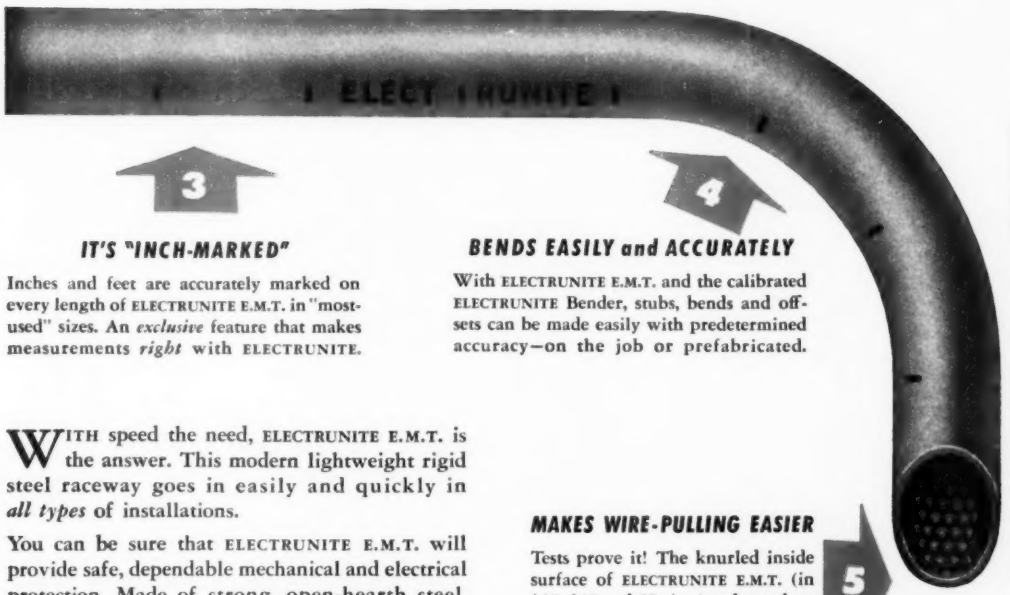


A typical installation of ELECTRUNITE *E.M.T. runs in an industrial plant . . . at P. R. Mallory Company, Indianapolis, Ind. —a leading manufacturer of large and small electrical equipment components.*

USE THE EXPERIENCE OF TRAINED WESCO MEN

E.M.T. Raceways

Installation 5 WAYS!



3

IT'S "INCH-MARKED"

Inches and feet are accurately marked on every length of ELECTRUNITE E.M.T. in "most-used" sizes. An *exclusive* feature that makes measurements *right* with ELECTRUNITE.

4

BENDS EASILY and ACCURATELY

With ELECTRUNITE E.M.T. and the calibrated ELECTRUNITE Bender, stubs, bends and offsets can be made easily with predetermined accuracy—on the job or prefabricated.

WITH speed the need, ELECTRUNITE E.M.T. is the answer. This modern lightweight rigid steel raceway goes in easily and quickly in *all types* of installations.

You can be sure that ELECTRUNITE E.M.T. will provide safe, dependable mechanical and electrical protection. Made of strong, open-hearth steel, ELECTRUNITE E.M.T. withstands all normal installation punishment and abuse. It's approved by the National Electrical Code and most local codes for exposed, concealed and concrete-slab installation—and every length carries the Underwriters' Laboratories label.

5

MAKES WIRE-PULLING EASIER

Tests prove it! The knurled inside surface of ELECTRUNITE E.M.T. (in ½", ¾" and 1" sizes) reduces drag—makes wire pulling as much as 30% easier.

REPUBLIC STEEL CORPORATION
STEEL AND TUBES DIVISION • CLEVELAND 8, OHIO
Export Department: Chrysler Building, New York 17, New York

CHECK WITH YOUR **ELECTRUNITE** *DISTRIBUTOR*

Give him all the time you can to plan ahead on your requirements. This will enable him to do his best to secure the electrical supplies you will need on schedule.

REPUBLIC STEEL

Republic
ELECTRUNITE E.M.T.

LIGHTWEIGHT THREADLESS RIGID STEEL RACEWAY

TO HELP YOU ON THE JOB—CALL **WESCO**
FOR QUALITY ELECTRICAL SUPPLIES AND SERVICE

TWO "EVEREADY" BEST SELLERS!

BRAND

Electrical construction and maintenance men are using the vastly improved "Eveready" No. 1050 industrial flashlight battery to power the rugged "Eveready" No. 1251 industrial flashlight for two reasons: *brighter light longer . . . and safe, long-lasting service*, under toughest conditions.

1. HERE, IN A NUTSHELL, ARE THE PLUS FACTORS FOR THE NO. 1050 CELL:

- Twice as much usable white light
- Extra light output . . . half the cost
- No metal can to leak or corrode
- Will not stick, swell, or jam in the flashlight

2. HERE ARE THE REASONS WHY THE NO. 1251 CASE IS SO POPULAR:

- Made of heavy brass sheathed in durable rubber and chemigum
- Cushions the shocks encountered in heavy-duty service
- Resistant to water, oils, greases, gasoline, alcohols and acids
- Sturdy switch easily taken apart and replaced by hand
- Ring recessed in bottom for carrying or hanging

Check the advantages of these outstanding "Eveready" products. They give you more for your money.

The term "Eveready" is a registered trade-mark of Union Carbide and Carbon Corporation

NATIONAL CARBON COMPANY

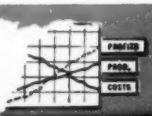
A Division of Union Carbide and Carbon Corporation

30 East 42nd Street, New York 17, N. Y.

District Sales Offices: Atlanta, Chicago, Dallas, Kansas City, New York, Pittsburgh, San Francisco

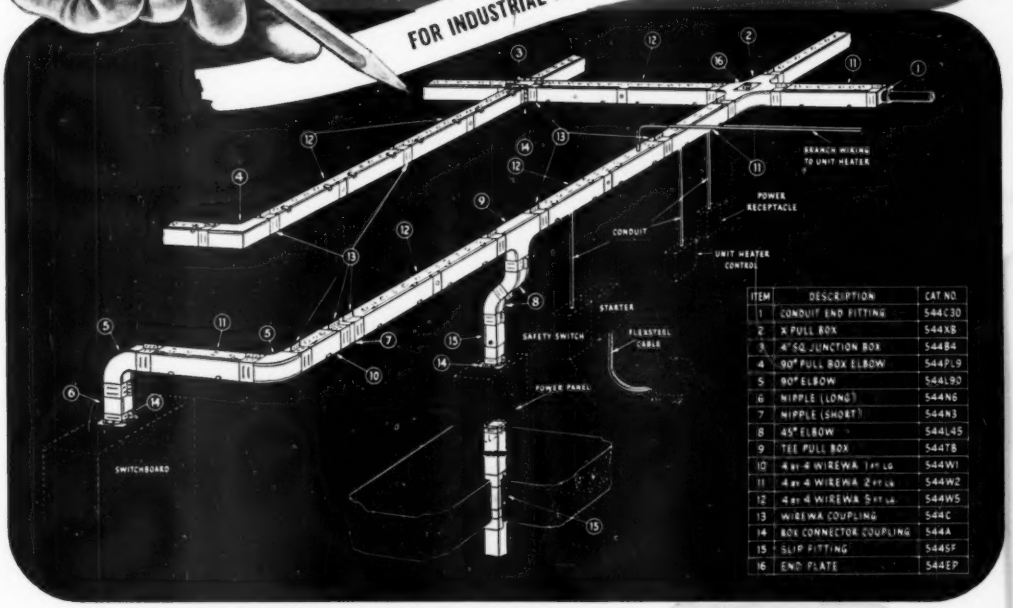
IN CANADA: National Carbon Limited, Montreal, Toronto, Winnipeg

FOR WIDE-AWAKE "INSIDE SERVICE"— CALL WESCO



Specify National Electric 4x4 WIREWĀ

FOR INDUSTRIAL AND COMMERCIAL WIRING MODERNIZATION



ITEM	DESCRIPTION	CAT NO
1	CONDUIT END FITTING	544C30
2	X PULL BOX	544XB
3	4" SQ. JUNCTION BOX	544B4
4	90° PULL BOX ELBOW	544PL9
5	90° ELBOW	544L90
6	NIPPLE (LONG)	544N6
7	NIPPLE (SHORT)	544N3
8	45° ELBOW	544L45
9	TEE PULL BOX	544T8
10	4 by 4 WIREWA 1 FT LG	544W1
11	4 by 4 WIREWA 2 FT LG	544W2
12	4 by 4 WIREWA 5 FT LG	544W5
13	WIREWA COUPLING	544C
14	BOX CONNECTOR COUPLING	544A
15	SLIP FITTING	544SF
16	END PLATE	544EP

Sketch of a typical 4 x 4 WIREWĀ installation showing complete flexibility, simplicity and use of fittings.

Plant men like National Electric 4 x 4 WIREWĀ for protecting wiring—wiring that may be rerouted, changed, tapped, or spliced frequently. National Electric WIREWĀ provides steel protection, plus accessibility, unequalled by any other type of wiring raceway, for housing of electrical wiring systems up to 600 volts.

STEEL FOR PERMANENCE . . .
GROUNDED FOR SAFETY!

Listed by Underwriters' Laboratories, Inc.

HERE'S WHY

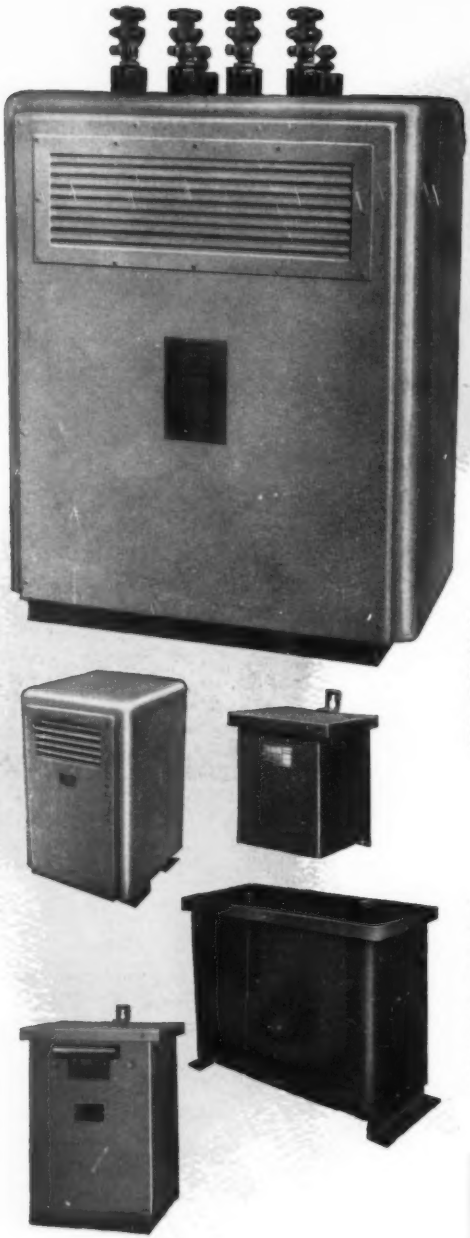
4x4 Wirewā will do the job.

- **It goes up fast . . . can be tapped or rerouted without disturbing existing installations.**
- **No flanges to line up and bolt when assembling sections. Wrap-around hinged couplings—only two bolts to tighten.**
- **It may be mounted direct to wall or suspended from ceiling. Couplings may also serve as hangers.**
- **Low maintenance, simple to reroute and extend —100% salvable.**

EVERYTHING IN WIRING POINTS TO

National Electric
PRODUCTS CORPORATION
1301 CHAMBER OF COMMERCE BUILDING, PITTSBURGH 19, PA.

FOR COMPETITIVE PRICES—CALL WESCO
FOR QUALITY ELECTRICAL SUPPLIES AND SERVICE



MORE KVA PER POUND!

Lightweight, dry-type transformers save space, cut installation costs. 3 through 167 kva, single phase, or 9 through 225 kva, three phase.

They're lighter and smaller! Compact, completely ventilated coils on Hipersil® cores—neatly enclosed in sheet steel cases for convenience of mounting, cleanliness, trim appearance.

Add all this to the savings inherent in dry-type transformer design:

NO VAULTS. Mount them on the floor, walls, posts or overhead platforms, close to the load they serve. They're safe.

SIMPLIFIED MAINTENANCE. No liquids to store, filter or replace. No gauges, radiators, valves or gaskets to get out of order.

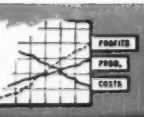
Westinghouse Dry-Type Transformers are available for voltage step-down or step-up applications or for phase changing. Types AJRB and AVRB (3 through 100 kva) have circuit breakers built into the high-voltage circuit, giving 3-way protection against damaging overloads or short circuits, cutting installation time up to 50%. Ask your Westinghouse representative for a copy of B-4428, or write Westinghouse Electric Corporation, P. O. Box No. 868, Pittsburgh 30, Pennsylvania. J-70607

YOU CAN BE SURE... IF IT'S

Westinghouse

DRY-TYPE TRANSFORMERS

FOR WHAT YOU NEED, WHEN YOU NEED IT—CALL WESCO



IT WON'T BREAK

if it's an O.Z. ALL-BAKELITE BUSHING!

BOUNCE IT

Bounce an O. Z. All-Bakelite Insulating Bushing hard, on a concrete floor — it rebounds good as new. Add to its superior strength* these extra features and you've got a bushing that's best by any test!

- **Smooth rounded edges completely protect wire insulation during pulling and when in service.**
- **Clean, deep threads let you spin-on the bushing with a twist of the wrist.**
- **Ribbed outer surface provides a grip for slippery hands and permits tapping with a screw-driver.**

O. Z.'s All-Bakelite Insulating Bushings are fully approved by Underwriters' Laboratories, meet all requirements of the National Electric Code.

Try a few, bounce 'em, treat 'em rough and you'll be convinced there are no all-Bakelite bushings better suited to the job . . . none so economical to use as O. Z.'s.

Available in sizes from ½ inch to 6 inches, cost no more than ordinary Bakelite bushings. Samples on request.

*56% stronger over all than all other leading all-Bakelite bushings actually tested by an independent laboratory.

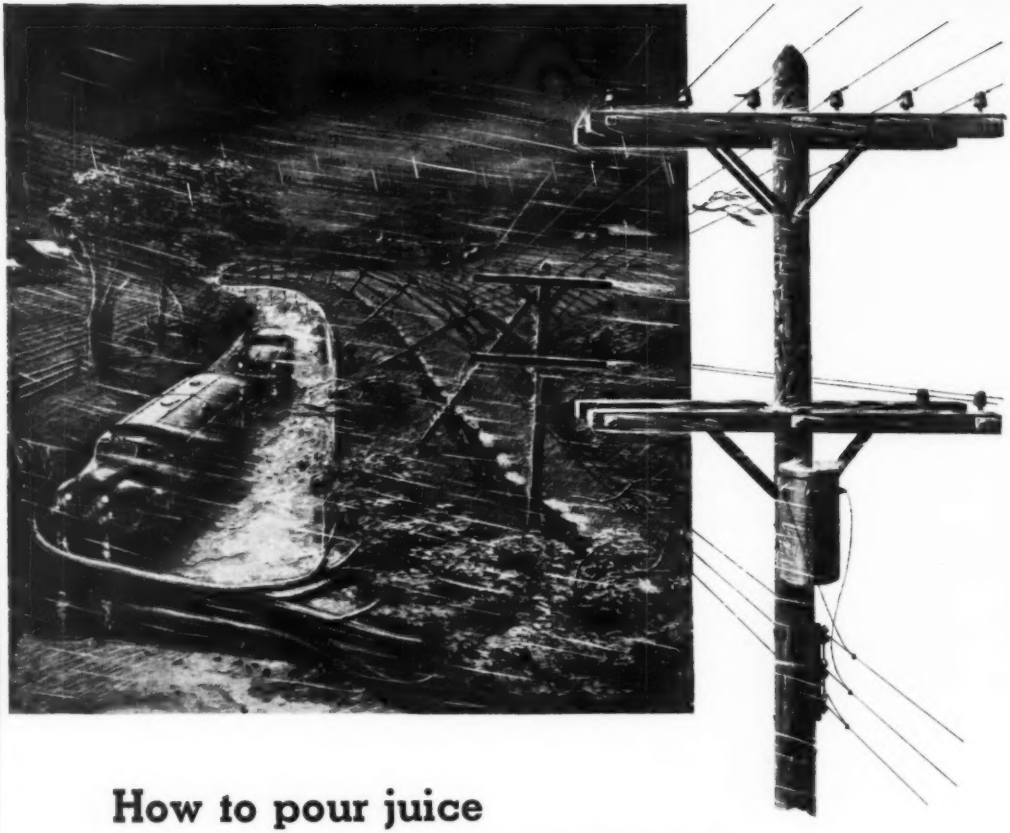
CONDUIT FITTINGS • CABLE TERMINATORS
CAST IRON BOXES • GROUNDING DEVICES
SOLDERLESS CONNECTORS • POWER CONNECTORS

Buy O. Z. and you'll see why Engineers say, "They're OK if they're O.Z."

O.Z. ELECTRICAL MANUFACTURING COMPANY, INC.

262 BOND STREET · BROOKLYN 2, N. Y.

4899



How to pour juice in a hurricane

IT'S QUITE A TRICK — so much so that the men who've mastered it merit more applause.

When a big wind or blinding blizzard "spills the juice" today, whole communities slow almost to a halt.

But that doesn't happen often. The nation's electric "lifelines" are kept alive by utilities men who've learned to outwit both weather and the attacks of time.

America takes for granted the *private* pleasures and *personal* profits created through *public* utilities of unparalleled efficiency.

Reminders of that efficiency are the poles that carry the nation's "lines of communication" reliably strung together with pole line materials made by Oliver Iron and Steel.

Oliver, A to Z

For 50 years, Oliver Wood Cob Pins have been pins of progress across the American map. Proudly precision engineered are the Oliver anchors and arms, bolts and brackets, clamps and clevises — right down the alphabet to yokes and zinc thimbles. Whatever the pole line need, there's a veteran Oliver product to satisfy it.

Long before electric lines, there was no greater name in steel than Oliver. Today, as for a century, Oliver stays a step ahead of new developments in putting things together with precision fasteners.

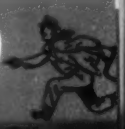
Wherever steel buildings rise, or assembly lines move, or trains roll, or ships sail—Oliver fasteners are there defying time and wear.

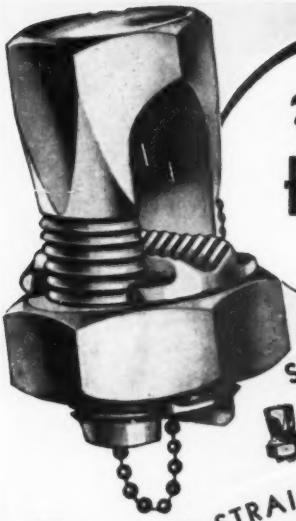
If you want to put something together — from skates to skyscrapers — get together with Oliver and you'll get it put together right.

Oliver Iron and Steel Corporation

PITTSBURGH, PENNSYLVANIA

FOR DELIVERIES TO MEET WORK SCHEDULES — CALL WESCO





You can find the

EXACT FITTING

you need — in the

SERVICE CONNECTORS

STRAIGHT CONNECTORS

TEES

LUGS

GROUNDING CONNECTORS

and MANY MORE

PENN-UNION Catalog

at any WESCO Branch

The conductor fittings shown here can only suggest the wide variety. You'll find practically every good type, in a complete range of sizes.

New connectors are constantly being added - - so when you need a special fitting for an unusual service, tell us about it. Most likely we have exactly what you want.

Better design is a Penn-Union feature that you'll appreciate. For example, note the large gripping surfaces for wrenches, on the service connector shown in the upper left corner. When you use any Penn-Union fitting, you are sure that it is dependable . . mechanically and electrically.

The most important items are Listed by Underwriters Laboratories

Preferred by Leading Users, who have found that the "Penn-Union" mark on a connector is their best guarantee of unfailing service.

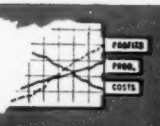
Stocked by
Wesco Branches

PENN-UNION ELECTRIC CORP.
ERIE, PA.

The COMPLETE Line of Conductor Fittings

PENN-UNION

FOR COURTEOUS, INTELLIGENT SERVICE — CALL WESCO



R&S DUST-TIGHT LIGHTING FIXTURES

...for hazardous locations where flammable or explosive dusts are present. Class II, Groups E, F, G and Class III.

With 2 Exclusive Design Features

Now R&S engineering contributes a new and important stride forward in Type DL lighting fixture construction and installation simplicity!

R&S Type DL Lighting Fixtures operate very *cool*—'way below allowable temperatures for this class of installation. They provide safe and efficient illumination for all locations where flammable or explosive dusts constitute a hazard.

Two R&S *exclusive* design features, added to the basic advantages common to other well-constructed dust-tight fixtures, are an important advance that assures faster, easier installation, and cleaning and relamping. Fixtures are made of rugged cast aluminum alloy—designed with smart streamlined simplicity—and shaped to prevent dangerous accumulation of dust particles. For detailed information and prices write for Data Sheet No. 7151-4.

1 Lampholders are located within the conduit box assembly of both pendent and junction box types, permitting installation and wiring without regard to size or style of fixture.

2 All fixture—globe—Reflector assemblies fit either base and are easily attached or interchanged by means of a simple bayonet slot and screw arrangement, without disturbing electrical connections.

Pendent and Junction Box bases are standard to all fixtures. They will accommodate any style fixture—globe—reflector assembly in either 100 watt or 200 watt sizes, providing complete interchangeability.

RUSSELL & STOLL COMPANY, INC. • 125 BARCLAY STREET, NEW YORK 7, N.Y. D-7

RUSSELL & STOLL

PRECISION-BUILT ELECTRICAL EQUIPMENT—SINCE 1902

Choose the Time Switch you need from this Complete Line

Specify SANGAMO *for Assured Performance*

"Precision in Miniature"

Type S
Time Switch
Single Pole
Single Throw

Type TJ
Plug-in Type
Interval Timer

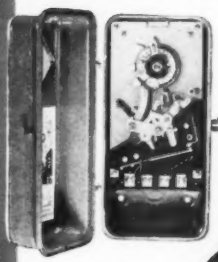
Heavy-Duty Switches

Type L
Synchronous

Type W
Synchronous-carryover

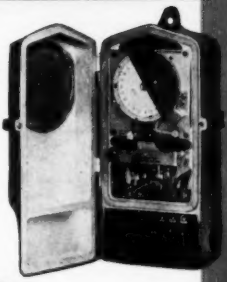
Astronomic Dial

Special Duty Time Switches



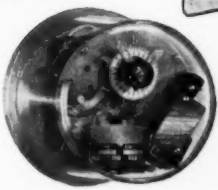
Type LY
Two-Circuit

Type LD
Duplex



Type TC
Electrically-wound

Type MA
Synchronous



Type WS
Synchronous-carryover

SANGAMO

SANGAMO ELECTRIC COMPANY

SPRINGFIELD · ILLINOIS

YOU NAME IT; WESCO HAS IT OR CAN GET IT

SURE WAY TO SATISFY FLUORESCENT LIGHTING CUSTOMERS PROFITABLY

Specify Westinghouse Fluorescent Lamps For:

1 Customer Approval

Your customers will appreciate their top quality and performance. For long life, continued high light output and uniform color, they are unexcelled.

2 More Profit For You

New Westinghouse discounts on quantity purchases mean extra profits for you on every fluorescent lighting job.

For more information call or write your Westinghouse Lamp Distributor or the Lamp Division, Westinghouse Electric Corporation, Bloomfield, New Jersey.

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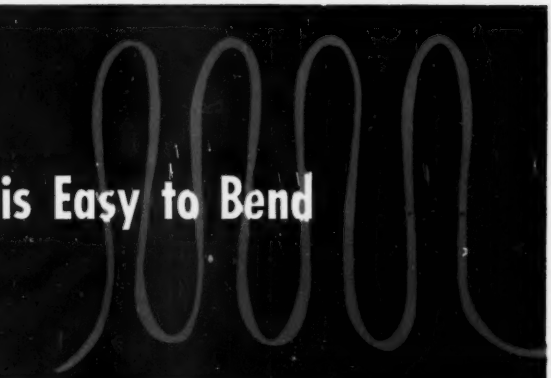
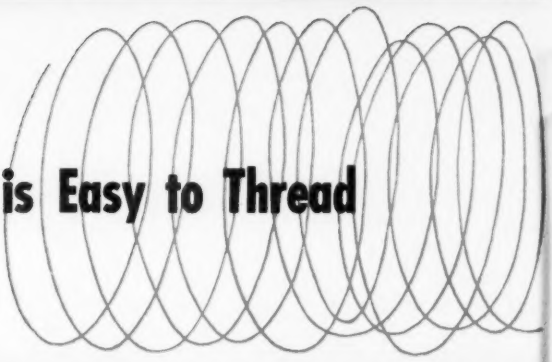


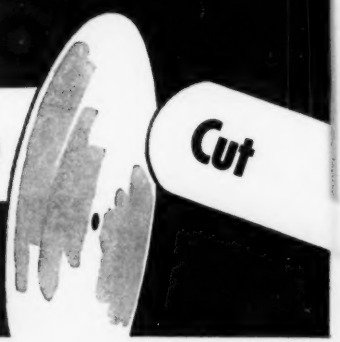
SPANG CENTRAL

Conduit is Easy to Thread



SPANG CENTRAL

Conduit is Easy to Cut



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The Spang-Central Big 4 are approved by Underwriters' Laboratories and comply with the National Electric Code. Spang-Central rigid or lightweight conduit is sold through prominent, recognized distributors.

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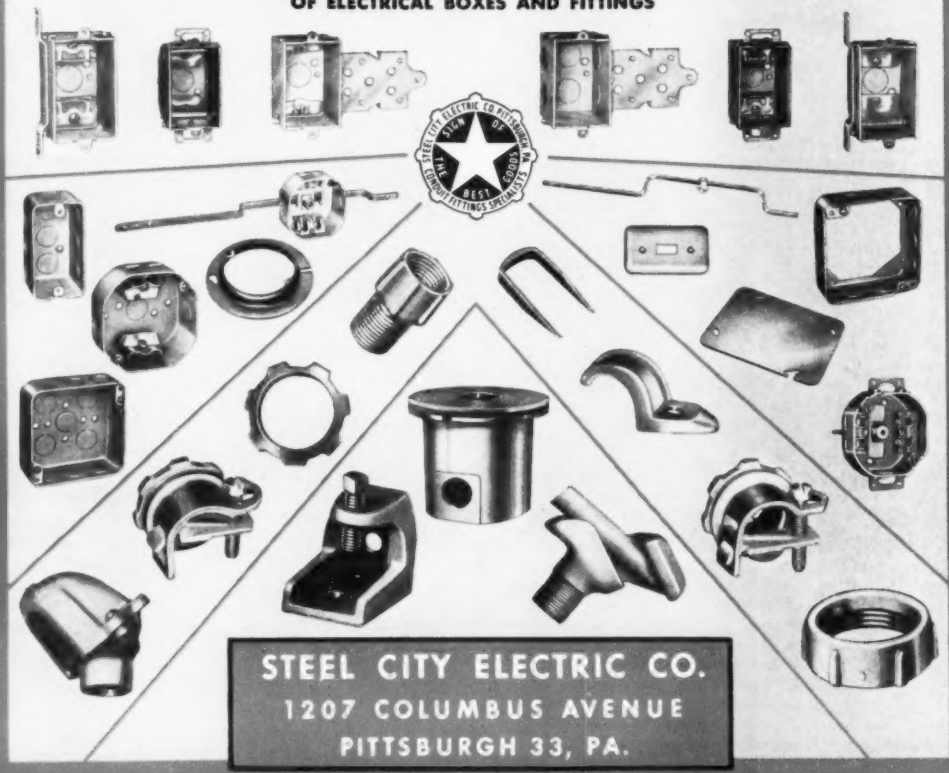

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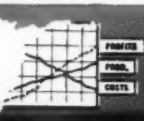

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The highest quality in neck type vibrating bells, giving resonant clear tone at maximum sound output. It's weatherproof, has a cast frame, is easily connected to exposed conduit or outlet box. Available in 4"–6"–10" diameters.

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A typical customer's problem: "To reduce the time spent on lighting maintenance."

Westinghouse recommendation: "To install Westinghouse Mercury Lighting."

Result: "Less than half as many fixtures to maintain and fewer lamps to replace, because mercury vapor produces more light per luminaire than any other lighting system."

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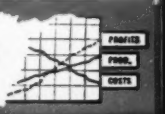

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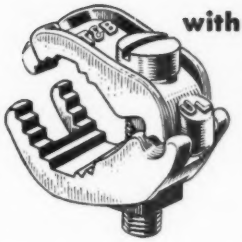

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THERE'S A T&B ENGINEERED PRODUCT for every wiring job in the complete T & B line of fittings for all conductors and raceways.

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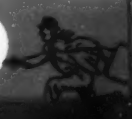

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From Molten Metal to Finished Fittings

Every Step Under WAGNER Control

• Wagner Fittings for thin-wall (EMT) conduit demonstrate the value of complete control of every step of manufacture from molten metal to finished product.

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One responsibility fuses together facilities, men, and experience to give you tough, accurately cast, precision threaded, perfectly finished, and quality inspected fittings.

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THE FINEST PORTABLE HAND LAMP MADE

NOW with NEŌTEX *Handle*

. . . a synthetic OIL-PROOF rubber, impervious to oils, greases and most chemicals.

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The new NEŌTEX PRŌTEX portable lamp is made of only the highest quality materials for Safety and Longer Life. NEŌTEX is a special oil-proof compound that makes the use of a NEŌTEX PRŌTEX portable practical even where oils, greases and most chemicals would deteriorate regular rubber.

Insist on a NEŌTEX PRŌTEX portable for oil-proof protection. All NEŌTEX PRŌTEX portable lamps are available with insulated fibre, bakelite and NEŌTEX coated wire guards . . . also with side outlet and switch handles.

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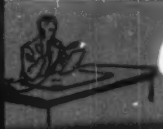

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A NATIONAL DISTRIBUTING ORGANIZATION WITH 110 OFFICE-WAREHOUSES

Practical Methods

TROLLEY DUCT SUSPENSION features "ceiling of light" display of fixtures in General Electric Supply Corp. Chicago city sales area; permits easy maintenance and quick replacement with new model units when required.

Flexible Mounting Of Display Fixtures

WIRING

When the General Electric Supply Corporation in Chicago recently remodeled and redecorated its city sales department, its lighting engineer faced two electrical problems. One was a method of displaying groups of fluorescent lighting fixtures representing a number of different manufacturers. The other was the choice of a wiring system which would facilitate quick and easy replacement of fixtures with new models and different types as occasion demanded.

The decision to use a trolley duct system (LTG Flex-A-Power) effectively solved both problems. The duct is suspended from the ceiling in rows parallel to the width of the room; is fed by circuits from a lighting distribution cabinet on the wall between two sales counters. Two or three fluorescent units, depending upon length, are suspended from each row of duct by hook-type supports (locking strap and nut design). Each fixture is fed by a plug-type take-off device inserted in the duct.

Fixture replacement is now a simple chore. A twist of the wrist, the loosening of two nuts and down comes the unit. In a few minutes, another fixture can be installed. Those units not frequently replaced (louverall sections, continuous row displays, etc.) are suspended from Unistrut supports to reduce the number of ceiling rods needed and to illustrate this specific mounting method.

LOW-VOLTAGE REMOTE control switching is added to lighting panel on wall between sales counters. Customers can operate all lights in room from these switches and see relays behind glass windows in panel.

Adding to the interest of this display lighting, which also serves as general illumination for the area, is the lighting distribution panel which incorporates a low-voltage remote-control system. While not necessary to control the display, this system was added for demonstration purposes. Hence, 27 individual switches and three master selector switches (which control nine circuits each from a single switch) are mounted at the bottom of the panel. Relays are mounted in rows on each side of the panel; are behind glass panels so interested customers can see them and the partition between the high and low voltage relay terminals.

G. E. Supply Corp. officials find their new arrangement serves several purposes. It displays lighting fixtures. It demonstrates to customers the functional advantages of trolley duct and the other mounting methods. It reduces fixture changeover and maintenance costs. It gives the customer a chance to play with the low-voltage remote control system and study its operation.

Riser System For Multi-Story Building

WIRING

When the Studebaker Corporation rewired its automotive plant in South Bend, Indiana, the entire secondary (as well as primary) distribution system was completely revamped. As designed by Giffels & Vallet, Inc., Detroit consulting engineers, in collaboration with Studebaker's plant engineering department, the secondary power feeders consist of 3-in conduits (each with three 500MCM cables) originating at first floor unit substations and extending upward to serve each floor of the multi-story structures.

In general, two individual feeder conduits serve each floor, each feeder energizing a long run of 40-ampere plug-in type distribution bus duct. The same scheme was applied to lighting feeders (either four 300MCM or four No. 4/0 cables per 3-inch conduit depending upon distance, except that each floor feeder serves a group of lighting distribution panels. There were no existing pipe shafts or available space in stair wells in which riser conduits could be installed without encountering numerous undesirable bends and offsets in conduit runs.

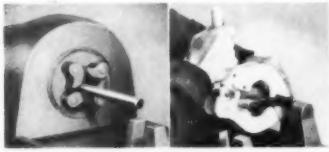
Both the engineers and Hatfield Electric Company (South Bend office), the electrical contractor on the project, wanted to keep conduit offset at a minimum and have free, straight cable pulls. To accomplish this, risers were grouped and extend up through the buildings at a point immediately above unit substation locations.

CUT CONDUIT THREADING COSTS **4 WAYS!**

with **QUIJADA CHIEF**

PIPE AND CONDUIT THREADER

THREADS, REAMS AND CUTS 2" CONDUIT IN 32 SECONDS!

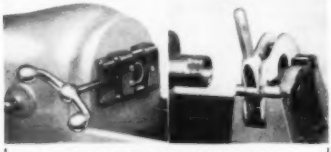


1. AUTOMATIC CHUCKING

Automatically grips and centers pipe. Just a pull of the switch to chuck and a push to release. Chucking always positive.

2. QUICK-OPENING DIE HEADS

Quick-opening instant change die heads make conduit size change a fast, effortless operation. More speed – Lower costs!



3. CUTTER ON JAW HOUSING

With cutter mounted on front jaw housing instead of behind die head it is simple to make up fittings on machine. Cutter removable for nipples.

4. REAMS WHILE THREADING

No waste time reaming! Flat blade reamer attached to end of die. Reams while die head is threading. Quickly removed for running threads.

SEE YOUR JOBBER
or write now to Dept. EC11

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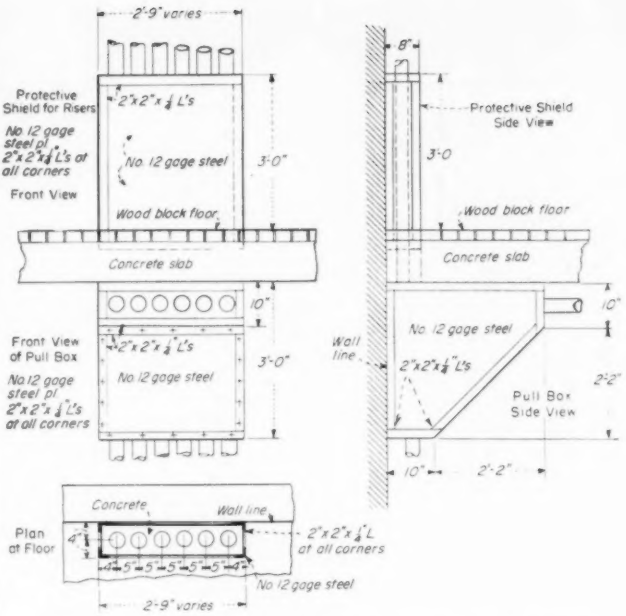


FIG. 2—CONSTRUCTION DETAILS of riser pull boxes and protective shields used on power and lighting feeders in manufacturing buildings.

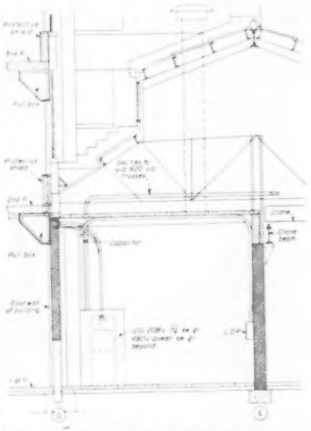


FIG. 1—SECTION THROUGH typical building showing riser system used for power and lighting secondary feeders. Note riser pull box at ceiling of each floor and protective shield at floor level. Area immediately to left of risers is a traffic aisle.

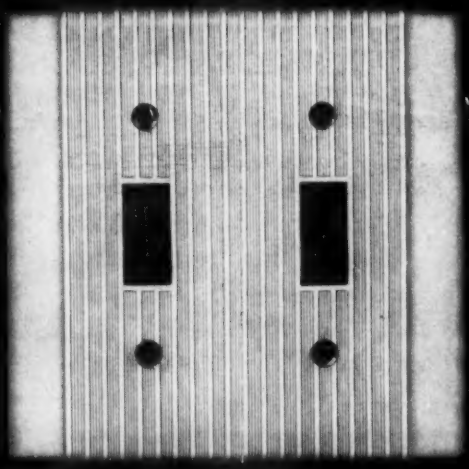
This meant that as many as eleven 3-inch conduits (including three spares) could extend upward on the first floor on the inside of the building wall; nine continue up through the second floor, and so on. Since they are in a traffic aisle, the conduits had to be side by side in a single row. At each ceiling juncture, the risers enter a large triangular-shaped pull box. This provides ample access space for cable installation and a means to branch out with the floor feeders without using conduit elbows.

Constructed of No. 12 gauge sheet steel on a 2 in. by 2 in. by ¼ in. angle-iron frame, each box is three-feet high (at the wall), three-feet deep (at the ceiling) and wide enough to accommodate the required number of risers. Where conduits enter the bottom and leave the front (at ceiling level), the pull box is squared off with 10-inch "face" plates. The inclined portion of the enclosure between these points has a removable screw cover to facilitate cable pulling, feeding, and training of floor feeders in a wide sweep where they branch out of the box.

Since the risers are actually in a traffic aisle, provision had to be made to protect them against mechanical damage. This was done by installing a box-like shield three-feet high, 8-inches deep and the same width as the riser pull box above. It is constructed of No. 12 gauge sheet steel with an exterior frame made of 2 in. by 2 in. by ¼ in. angle-iron. The shield encloses the conduits on all four sides and is filled with concrete to strengthen it against impact.

Riser pull boxes and protective shields at floor level were used on the lighting feeders and power conduits.

For *beautiful* NEW "UNILINE" Plastic Wall Plates



THE ANSWER IS BRYANT

No. 92072

Here is a complete new line of plastic wall plates of modern design which adds an attractive touch to electrical installations. Now available, the new Bryant UNILINE plates are:

The latest in durable, molded plastic for use where good appearance is a must.

Designed to blend with any decorative scheme.

Easier to clean and keep clean—no dust catching rough edges or deep grooves. A damp cloth wipes away smudges or dust.

Available in brown or ivory.

Meet Federal and R.E.A. Specifications.

J-99861

BRYANT
SUPERIOR WIRING DEVICES

Specify Bryant Devices from your Electrical Distributor

THE BRYANT ELECTRIC COMPANY
Bridgeport 2, Connecticut
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DONGAN POWER CIRCUIT TRANSFORMERS

How to Economize

In the Lighting and Operating of Machine Tools

For general factory lighting and for the lighting and operation of machine tools, much labor and critical material can be saved by the use of Dongan Power Circuit Transformers. Instead of installing separate circuits, simply run branch circuits from the power line.

RESULT: A saving in time, a saving in man power, and a saving of precious copper.

Write for Booklet On Transformer Connections

DONGAN ELECTRIC MFG. CO.
2980 Franklin Detroit 7, Mich.

The Dongan Line Since Nineteen-Nine

DONGAN TRANSFORMERS

TWO SLOTS IN BASE of this core stacking fixture (straight arrow) permit moving angle leg back so completed transformer core can be tipped out of fixture (curved arrow).

Fixture For Stacking Transformer Cores

PRODUCTION

By simply adding a couple of slots to one end of the base fixture used in stacking transformer cores, this phase of the assembly operation has been speeded up and made safer at the Allis-Chalmers Manufacturing Company plant in Milwaukee, Wisconsin.

The base of the fixture is constructed of two sections of inverted channel iron mounted in "cross" fashion. To each of the four "feet," an angle-iron "leg" is mounted by two bolts. These angles hold the three legs of the transformer core during the stacking operation.

Previously, when the core was completed, it took two men or a small crane to lift the 100-pound assembly from the fixture after loosening the bolts. Now, it is only necessary to loosen the two bolts on the angle at the slotted end of the base, move it back, and the completed core can be easily tipped over and turned out of the fixture in one easy movement.

Plastic Conduit Cuts Installation Time

CONSTRUCTION

The Code Electric Company in Houston, Texas, recently used plastic pipe on a 9-unit apartment project, and installed plastic tubing in approximately 300 homes to facilitate the post-construction installation of telephones. As specified by local ordinances, small conduits must be installed at the time of construction to permit the later addition of telephone service. These small

(Advertisement)

BIDDLE Instrument News

- ELECTRICAL TESTING INSTRUMENTS
- SPEED MEASURING INSTRUMENTS
- LABORATORY & SCIENTIFIC EQUIPMENT

NUMBER 9 OF A SERIES

JAMES G. BIDDLE CO., 1316 ARCH ST., PHILADELPHIA 7, PA.

REDUCE ELECTRICAL BREAKDOWNS IN YOUR PLANT with a Regular Schedule of INSULATION RESISTANCE TESTS

Irwin Robbins, Electrical Engineer, Factory Mutual Engineering Division writes in a recent article in PLANT ENGINEERING:

"The greatest single cause of electrical machinery breakdown is the failure of the insulation. Despite improvements in insulating materials in the past decade, insulation is still the most vulnerable part of an electrical machine . . ."

Typical damage to generator windings

It naturally follows that a regular program of checking the condition of electrical insulation pays off. Much can be saved in prevention of motor damage, wasted current, loss of production and *danger* to life and property.

For more than a half century the Megger Insulation Tester has been a highly effective means for testing any type of electrical equipment, whether a-c or d-c and irrespective of the voltage rating of the apparatus. It is direct-reading, easy to use and has its own source of power. It permits non-destructive tests which disclose incipient insulation weaknesses, rather than merely signaling insulation breakdown that has already occurred.

A series of periodic tests recorded on charts supplied with each Megger set assures you that the insulation of a machine is holding up . . . or warns you that insulation is becoming weaker and conditions should be investigated.

Most Trouble is Caused by Dirt or Moisture

It is more economical to blow out dust, dry out coil windings, eliminate oil conditions, or even replace a motor or generator on off-hours *at the convenience* of the production and maintenance departments—than to have trouble strike unexpectedly and production interrupted indefinitely.

The story of electrical insulation resistance is told in our easy-to-read booklet entitled "For Practical Men." Most maintenance men, who have seen it, have requested extra copies for their associates. *Yours* will be mailed free of charge by simply writing for Bulletin 21P8-ECM.

GETTING THE MOST FROM INSULATION RESISTANCE MEASUREMENTS . . .

Interpreting Results When Time and Test Voltage are Changed

Electrical men agree that the accepted method of determining whether insulation is healthy is by measuring its resistance. Megger Insulation Testers have long been the popular choice of men charged with the responsibility of electrical maintenance. These men recognize the importance of the proper analysis of the readings they obtain with their Megger instruments. The best thinking of men who know is available in Biddle literature on the subject. For our latest publication on electrical insulation resistance, "For Practical Men," just write to us at the address above and we will mail it at no obligation. Many who have already read this helpful booklet are requesting additional copies for their departments. Ask for Bulletin 21P8-ECM.

ONE MEGOHM per 1000 v is still a good practical guide

THERE'S ECONOMY IN THE FLEXIBILITY OF THIS INSTRUMENT . . .

Dual-Operated Meg Type Megger® Insulation Tester

Serves for field tests where no current is available or for repetitive or time tests by plugging into 115 v. 60 cycles.

Operate by hand or plug in the rectifier—it's always ready for service—either way.

The rectifier offers advantages for such applications as:

1. Production testing of all types of electrical equipment and components.
2. Testing multi-conductor communication cables, as in telephone plants.
3. Testing multi-conductor control circuits in power plants.
4. Acceptance tests, such as from load centers, in lighting and power installations.
5. Testing multi-conductor control and power circuits at central locations in railway signal installations.
6. Testing generators, cables and other equipment by the time-resistance method, where the dielectric absorption or leakage current of the insulation under test is high enough to bring the resistance measurement within the range of these models.
7. Experimental and laboratory use.

Write for Bulletin 21-46-ECM.

We are constantly publishing new technical bulletins on Biddle Instruments. A complete list of our latest bulletins will be mailed you on request, so that you may check it to bring your files up to date. Request list ECM.

when you want tools fast

.... Phone your nearby Snap-on factory branch

● You'll talk to a *tool man* when you get your Snap-on branch on the wire. He'll understand your wants clearly, and help you select the most efficient tools for your needs. You'll get professional tools of the finest character — properly designed, strong, versatile, *safe,* Snap-on Tools—that will serve you long and well. For 30 years, plants—large and small—have used and endorsed this "time-saving way to buy time-saving tools." May we send you copies of the latest Snap-on Industrial and General Catalogs? Write—

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8048-K 28th Ave., Kenosha, Wis.

FACTORY BRANCH WAREHOUSES IN 41 INDUSTRIAL CENTERS

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Charlotte 6, N. C., 915 S. Clarkson St.
Chicago 16, Ill., 2023 Michigan Ave.
Cincinnati 6, Ohio, 705 E. McMillan St.
Cleveland 15, Ohio, 2912 Euclid Ave.
Dallas 1, Texas, 2932 Commerce St.
Denver 3, Colo., 1050 Broadway
Detroit 2, Mich., 93 Piquette Ave.
Edmonton, Alberta, 10232 103rd St.
Fargo, N. Dak., 421 N. P. Ave.
Houston 3, Texas, 1810 LaBranch St.
Indianapolis 2, Ind., 848 Fort Wayne Ave.
Jacksonville 6, Fla., 1602 Walnut St.
Kansas City 2, Mo., 3635 Main St.
London, Ontario, 111 Mt. Pleasant Ave.
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Milwaukee 3, Wis., 2600 W. State St.
Minneapolis 3, Minn., 1218 Harmon Place
Montreal 15, Quebec, 751 Jean Talon St., West
Newark 6, N. J., 823 Sandford Ave.
New Orleans 13, La., 1040 Camp St.
New York 56, N. Y., 397 East 167th St.
Oklahoma City 3, Okla., 901 N. Hudson St.
Omaha 2, Nebr., 109 S. 24th St.
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Pittsburgh 8, Pa., 7007 Kelly St.
Regina, Sask., 2070 Albert St.
Richmond 20, Va., 1617 West Broad St.
San Francisco 2, Calif., 635 Golden Gate Ave.
Seattle 22, Wash., 1501 Olive Way
St. Louis 3, Mo., 2647 Washington Blvd.
Syracuse 3, N. Y., 323 Irving Ave.
Toledo 6, Ohio, 2932 Monroe St.
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Vancouver, B. C., 1043 Davie St.
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***Foremost* IN HAND TOOL ENGINEERING, MANUFACTURE, DISTRIBUTION**

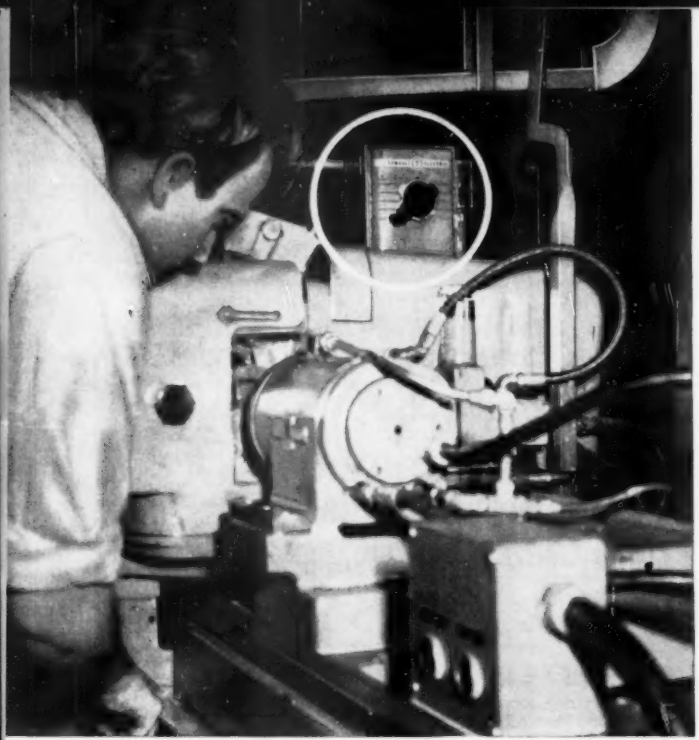
PLASTIC TUBING can be bent cold, stapled directly to studs and installed in half the time required to run rigid conduit. Telephone cables can be hooked to fish wire after tenant takes possession, and pulled into the home to provide home service.

SEMI-PLASTIC PIPE can be advantageously used for larger installations, with wires easily pulled into junction boxes, and boxes nippled back to back to supply service in two adjoining rooms.

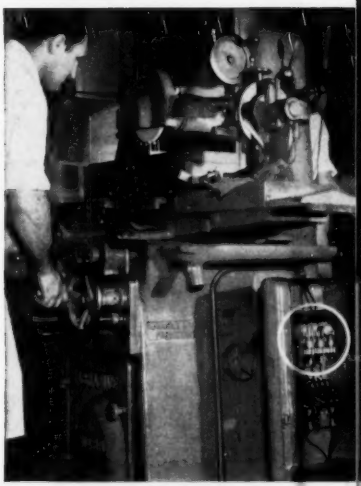
conduits are either installed with a fishing wire in place, or are later wired by means of a spring steel wire used by the telephone crew.

Code Electric has found that plastic tubing is acceptable to local authorities and, because of its flexibility and lightness (about 11% the weight of steel conduit), it can be handled easily. It can be bent cold and stapled directly to the studding of the homes. They estimate that the installation time has been practically cut in half.

For larger installations, the semi-rigid pipe also has factors of handling ease and installation speed. In the apartment development mentioned, runs up to 140 feet in length were handled without any difficulty.



IN SAFETY SWITCHES—Marlin-Rockwell Corporation's ball bearing factories use 30 ampere HCI switches as disconnects for high frequency motors used to power internal grinders. HCI interior is removable for easy wiring and inspection. No exposed live parts when switch is OFF and door open. Underwriters' Laboratories Approved.



IN COMBINATION STARTERS—Rugged, simple construction of HCI is perfectly adapted to use as disconnect in combination starters.

SELL NEW SAFETY SWITCH

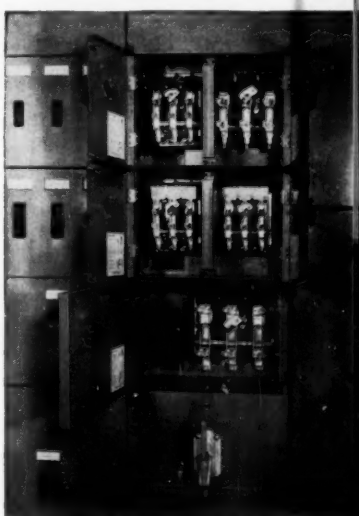
for Multiple Applications

The initial success of Trumbull's HCI (High Capacity Interrupter) as a Type A safety switch has led to its adoption for use as disconnect in combination starters, control centers and switchboards.

The HCI has many selling points. For example—for the first time in a safety switch, magnetic repulsion is used to break load quickly, safely. Double-break contacts are projected and withdrawn with piston-like speed and force. The arcs repel each other and strike against grid pins, breaking into smaller arcs which cool rapidly.

The unique arc-quenching action provides safety, lengthens contact life by preventing pitting, and gives the switch much greater life expectancy. HCI withstands heavy short circuits without damage.

Sell HCI wherever a safety switch or component disconnect is needed.



IN SWITCHBOARDS AND CONTROL CENTERS—Compact 30 and 60 ampere HCI switch interiors can be mounted in twin switchboard units (100 ampere HCI takes same vertical space), saving trough space and providing dependable short-circuit protection and sure ON-OFF handle indication.

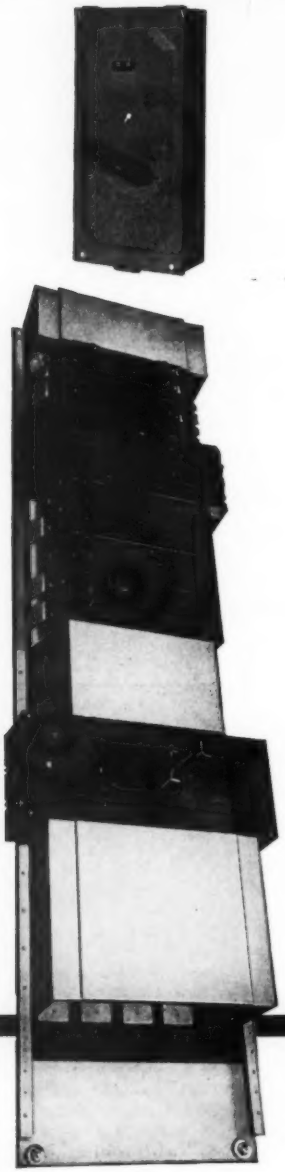
TRUMBULL (T) ELECTRIC

DEPARTMENT OF GENERAL ELECTRIC COMPANY

PLAINVILLE, CONN.

To meet any Circuit Protection needs

CHOOSE FROM THE COMPLETE LINE OF



I-T-E breakers provide consistent, dependable overcurrent protection in

PANELBOARDS • SWITCHBOARDS
LOAD CENTERS • INDIVIDUAL ENCLOSURES

The full line of I-T-E molded case circuit breakers meets any need. The I-T-E line provides safe, dependable, overcurrent protection for all lighting, power and distribution circuits.

When you choose a circuit breaker made by I-T-E you get:

LONG LIFE—Rugged, dependable I-T-E construction assures maximum service.

EXTRA SAFETY—Completely enclosed terminals mean added protection. Greater pole center spacings afford extra electrical clearance.

EASE OF APPLICATION—Uniform design on multiple pole center dimensions provides ease in mounting and construction. Special devices are available compactly mounted within the breaker case.

I-T-E circuit breakers cover a full range of ratings:

Voltages 125—600 volts a-c
125—250 volts d-c

Continuous current 10—600 amperes

Interrupting capacity 5000—25,000 amperes

1, 2, or 3 poles

Approved by the Underwriters Laboratories, Inc.

For further information on circuit breakers to meet your needs, write I-T-E Circuit Breaker Company, 19th & Hamilton Streets, Philadelphia 30, Pennsylvania.

I-T-E CIRCUIT BREAKER COMPANY

Subsidiaries:

Railway and Industrial Engineering Co., Greensburg, Pa.
Eastern Power Devices, Ltd., Toronto, Canada

I-T-E MOLDED CASE CIRCUIT BREAKERS

SELECT THE RATINGS AND DEVICES TO FIT YOUR APPLICATION

Ratings, Protective and Other Devices, Special Features			BQ 50 Amp Frame	BT 50 Amp Frame Ph. and Ind. Mtg	BT 100 Amp Frame "P"	BT 100 Amp Frame "G"	BT 225 Amp Frame "K"	BT 600 Amp Frame "L"
			1 and 2 Pole	1, 2 and 3 Pole	2 and 3 Pole	2 and 3 Pole	2 and 3 Pole	2 and 3 Pole
Ratings	Ampere Ratings		10–50 A	15–50 A	15–100 A	50–100 A	70–225 A	125–600 A
	A-C Voltage Ratings		1 P 120 V 2 P 120/240 V	1 P 125 V 2 and 3 P 250 V	LV 250 V HV 600 V	LV 250 V HV 600 V	LV 250 V HV 600 V	LV 250 V HV 600 V
	D-C Voltage Ratings		—	1 P 125 V 2 and 3 P- 125, 250 V	LV 125/250 V HV 250 V	LV 125/250 V HV 250 V	125/250 V and 250 V	125/250 V and 250 V
	Interrupting Ratings	a-c	5,000 A	5,000 A	LV 5,000 A HV 10,000 A	—	10,000 A	10,000 A
	Underwriters' Labs. Inc	d-c	—	5,000 A	5,000 A	—	10,000 A	10,000 A
	Interrupting Ratings	a-c	5,000 A	5,000 A	LV 5,000 A HV 15,000 A	15,000 A	15,000 A	25,000 A
	NEMA	d-c	—	5,000 A	LV 5,000 A HV 10,000 A	5,000 A 10,000 A	10,000 A	20,000 A
	Quick Make Quick Break Mechanism		✓	✓	✓	✓	✓	✓
Protective Devices	Thermal Trip	N	—	✓	—	—	—	—
		I	—	—	—	—	—	—
	Thermal Fixed Magnetic Trip	N	✓	—	✓	✓	—	—
		I	—	—	—	—	—	—
	Thermal Adjustable Magnetic Trip	N	—	—	—	—	—	—
		I	—	—	—	—	✓	✓
	Adjustable Magnetic Trip	N	—	—	✓*	—	—	—
		I	—	—	—	—	✓*	✓*
	Undervoltage Trip		—	—	✓	✓	✓	✓
Other Devices	Shunt Trip		—	—	✓	✓	✓	✓
	Auxiliary Switch		—	—	✓	✓	✓	✓
	Alarm Switch		—	—	✓	✓	✓	✓
	Mechanical Interlock		—	—	✓	✓	✓	✓
	Field Discharge Contact		—	—	✓	—	✓	✓
Other Features	Non-Automatic		—	✓	✓	✓	✓	✓
	Oil Immersed		—	—	✓*	—	✓*	✓*
	Center Studs		—	—	✓	✓	✓	✓
	Drawout Connectors		—	—	✓	—	✓	✓

* —Available in 250 V d-c, 600 a-c only.
N—Non-interchangeable overcurrent trip.
I —Interchangeable overcurrent trip.

WANT MORE INFORMATION?

Bulletin 5004-D gives description of the complete I-T-E line.

Catalog Section 5000 contains technical selection and application data, dimensions and prices. It's yours for the asking.

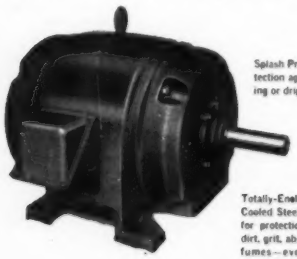
Wagner
ELECTRIC MOTORS
...the choice of leaders in industry

wherever motor hazards prevail...

GUARD PRODUCTION WITH Wagner Protected Motors

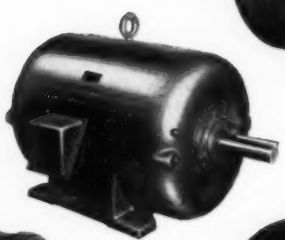
Do you use motors in locations where dirt, filings, moisture, splashing liquids, explosive gases, acid fumes, or other motor hazards prevail? If you do —no matter how severe the operating condition—Wagner can furnish the *right* motor for your purpose, adequately protected for specialized requirements.

Wagner protected type motors are known for completely dependable operation in their specific applications. They are backed by sixty years of motor building experience. Five protected-type Wagner Motors are shown below. Bulletin MU-185 gives full information . . . write for your copy.

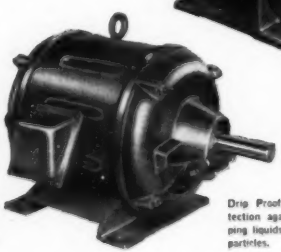


Splash Proof—for protection against splashing or dripping liquids.

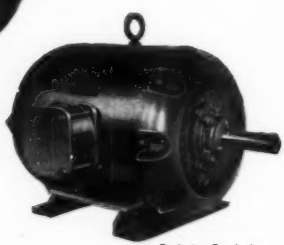
Totally-Enclosed Fan-Cooled Steel Frame—for protection against dirt, grit, abrasives, or fumes—even in abnormal quantities.



Totally-Enclosed Fan-Cooled Cast Iron Frame—for protection against corrosion from fumes or moisture.



Drip Proof—for protection against dripping liquids or falling particles.



Explosion Proof—for complete protection in hazardous atmospheres.

Wagner Electric Corporation
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M51-10

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ELECTRIC MOTORS • TRANSFORMERS • INDUSTRIAL BRAKES
AUTOMOTIVE BRAKE SYSTEMS — AIR AND HYDRAULIC

BRANCHES IN 31 PRINCIPAL CITIES

Motor Shops

TAGS ARE FASTENED to motors in the shop for ready recognition. Duplicate cards are filed alphabetically, under customers' names, and numerically, under job numbers.

Duplicate Cards Speed Motor Reference

Rapid and accurate reference files are being recognized by an ever-increasing number of motor shops as a method for eliminating errors, reducing the time consumed by telephone calls, speeding billing procedures and maintaining good customer relations. A wide variety of cards, tags and forms are used for this purpose. Many are standardized. Others are specifically designed for the operations of certain shops. But all of them are useful tools when used intelligently.

George Williams, owner of the Superior Electric Company of Springfield, Mass., uses duplicate 5-by-8-inch file cards for this purpose. These cards contain the customer's name, address and (for speed in verification or checking details) telephone number. All motor data and physical characteristics are also listed, and dates (on which the motor is received, promised, completed, delivered and billed) are included.

Space is provided for special customer instructions (on the front of the cards) and a report of the trouble as discovered on stripping (on the rear). Should the original and stripping diagnoses differ, the customer is immediately advised before repairs are made, saving the embarrassment of explaining at a later date charges that were not originally contemplated.

Material and parts required are tabulated on the front, with their unit and total costs, and notations of whether the material is taken from stock or on order. Billing data is recorded on the back of the cards, with notations regarding the operations performed, dates, regular time or overtime.

The bottom has spaces for total labor, overhead, material and miscellaneous charges.

Duplicate cards are filed 1) alphabetically under customer's name, and 2) numerically under order number, making it easy to rapidly locate the entire history of a job in progress or completed.

Another procedure used in the Superior shop to eliminate errors is to stamp the job number on the rotor and motor frame.

An easily-spotted yellow tag is also fastened to motors for rapid recognition.

Mr. Williams finds that the few minutes required to keep these records pay dividends in later savings in time and in the elimination of errors.

The efficiency which these reference records develop in shop operations can afford an increase in the work capacity of any motor shop.

Rotor Cradle Is Adjustable

Rotors of small motors are held in position for repair and rewinding by means of an adjustable cradle, in the shop of the Tennessee Electric Motor Service Company in Knoxville, Tennessee. The cradle is formed by two arms, the upper parts containing threaded hooks, and the lower portions passing through a hardwood block fixed to the repair benches. Since the two segments of the hardwood block can be loosened or tightened, the arms can be moved in or out to accommodate large or small rotors and, since the base can be rotated to any desired azimuth, the operator can position the rotor in any convenient position. The holding hooks are loosened or tightened by means of threaded handwheels.

CRADLE is adjusted as to azimuth and width by means of handwheels on the arms and base block of this rotor-holding device in the shop of the Tennessee Electric Motor Service Co., Knoxville.

Vacuum Tank for Coil Impregnation

Insulation varnish impregnates coils thoroughly and rapidly in the shop of Pittsburgh's Electric Manufacturing and Repair Company, for coils are first placed in a vacuum of minus 25 psi. When varnish is admitted to the tank under these conditions, it fills all voids completely and the resulting insulation is time-tested to be far better than conventional dipping at atmospheric pressure. During the impregnation cycle the tank top is dogged

"DOW CORNING SILICONE INSULATION HAS MEANT A CONSIDERABLE INCREASE IN OUR TOTAL VOLUME OF BUSINESS."

MR. C. R. DURAND, Service Shop Supt.
H. N. CROWDER, JR. COMPANY
Allentown, Pa.

EVERY motor that enters your shop is a failure. Quite often, a simple repair or rewind job will restore its usefulness. But many failures are repeaters. Those are the motors that come back to you again and again, simply because of the severe but unavoidable conditions under which they must operate. It's not your fault, but your reputation is almost certain to suffer. It's part of your job to make custom-built motors out of standard equipment.

That's where Class H insulation made with Dow Corning Silicones comes in. If a motor is subject to abnormally high ambient temperatures, high starting torque, overloads or excessive moisture, Dow Corning Silicones can make it last 10 times longer than it ever did before.

That's why more and more maintenance, production and top management men now specify Class H insulation for hard-working motors. Only Class H insulation gives them the kind of motors they need, and it pays for itself many times over by eliminating down time, wasted man-hours and replacement costs.

And that sets you up as an authority on difficult motor problems, too. You gain first consideration, even for ordinary jobs. You earn a better profit margin on Class H; you gain prestige and win those new customers that increase your total volume of business. That's why:

Dow Corning Silicones Build Rewind Business!

Write Today

For more information, technical or sales assistance, call our nearest branch office or write to Dept. G-11.

DOW CORNING CORPORATION
MIDLAND, MICHIGAN

ATLANTA • CHICAGO • CLEVELAND • DALLAS
LOS ANGELES • NEW YORK • WASHINGTON, D. C.

DOW CORNING SILICONES

INSULATION is quicker and more thorough when varnish is applied to coils under vacuum conditions created in the shop of the Electric Manufacturing and Repair Company, Pittsburgh, Penna.

down and coils are supported by a wire basket which is formed to fit comfortably inside the tank. An overhead rolling crane, running along the lower flange of a roof-supporting I-beam, is available for lowering or raising the basket when desired.

Tray Support Folds Into Small Bake Oven

Most motor repair shops throughout the country have one or more small electric bake ovens to increase the efficiency of their operations. Generally, these units are used for small motors or parts or for an emergency job to save the time normally required to bring a large oven up to the required temperature. Methods used to load these ovens are frequently as varied as the designs and sizes of the ovens themselves.

The Wm. C. Krauth Electric Company in Louisville, Ky., designed and built an electric oven that is 37 inches deep, 36 inches high and 32½ inches wide with a single, front-opening door. Parts to be baked are placed on a movable tray which is 32½ inches long, 25½ inches wide and 1½ inches deep. When the oven is being loaded, the tray is pulled out and extends practically full length beyond the oven door. After being loaded, the tray is pushed into the oven enclosure and the door is closed tight.

In some oven designs, such a tray is placed on a dolly for loading; in others, the tray rides a stationary track which remains in front of the oven and is an integral part of the unit. In both these cases, the trays are equipped with wheels or casters

Don't break feeder insulation or "splice-in" ammeter to take readings. Just "Amprobe" it!

To check motor overloads, starting currents, opens, shorts and voltage, just "Amprobe" it!

To balance loads, locate grounds, check circuit capacity and voltage losses, just "Amprobe" it!

For checking start and running currents, shorts, relay setting, voltages, etc., just "Amprobe" it!

That's why you should "AMPROBE" it!

$49.50

THE ONLY POCKET-SIZED SNAP-AROUND VOLT-AMMETER

These and many other time-saving, money-making applications have made the Amprobe a "must" tool with electricians in every field. The only snap-around volt-ammeter that fits in your pocket is made for your pocket and priced for your pocket.

Model A-6 (illustrated) measures 0/10/25/50/100/250 amps AC and 0/150/600 volts AC. Other models for specific applications also available. Accuracy is ±3% of full scale. Built for rugged service. Available at better supply houses for only $49.50 complete with belt-mounting carrying case and voltage test probes.

Pyramid Instrument Corp., 49 Howard Street, N. Y. 13, N. Y.

AMPROBE | **"SENSITIZER" MODEL A30**

Increases Amprobe sensitivity by 10 times. Adds 3 low-current ranges. 0-1; 0-2.5 and 0-5 amps. Also "splits" the line on sealed conductors. Only $4.85

PYRAMID INSTRUMENT CORP. ECM-111
49 Howard St., New York 13, N. Y.

FREE! 30 ways to "Amprobe" it and save time and money now described in new booklet "Servicing With the Amprobe". Send for your copy today!

Name_____

Company_____

Address_____

City_____ Zone____ State_____

SORGEL AIR-COOLED Dry-Type TRANSFORMERS

WAIT! *Be Patient!*

It will pay you to wait a little longer than usual for Sorgel Air-Cooled Transformers, because you will then receive transformers in which our well-known high standards are being maintained.

Although our deliveries are longer now because of increased orders and shortage of critical materials, our usual quick deliveries will be restored when the material shortage is relieved.

Another reason for our longer deliveries is because so many more want the best Dry-Type transformers.

LIBERAL DESIGN for continuous hard service.

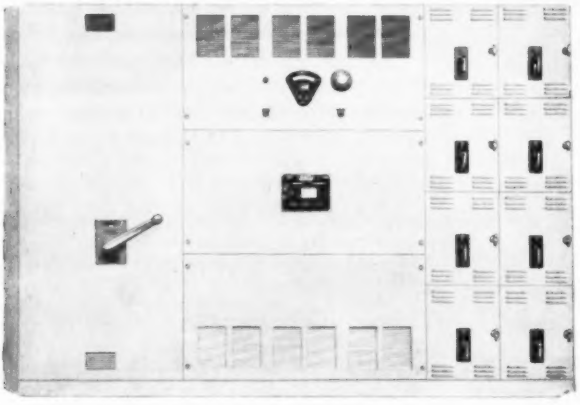
SUBSTANTIAL CONSTRUCTION for long life and endurance.

HIGH EFFICIENCY for economical operation.

CONVENIENTLY ARRANGED for easy connecting and simple installation.

Sizes up to 2000 Kv-a. and up to 15,000 volts.

¼ Kv-a Single Phase 460/230 to 230/115 volt



2000 Kv-a. 12,000 volt sub-station, with primary fused load interrupter switch, temperature indicator and alarm, and extra contacts that may be used to operate forced draft fans to increase capacity 25%

Sales Engineers in Principal Cities

SORGEL ELECTRIC CO., 836 W. National Ave., Milwaukee 4, Wis.

Pioneers in the development and manufacturing of Air-Cooled transformers

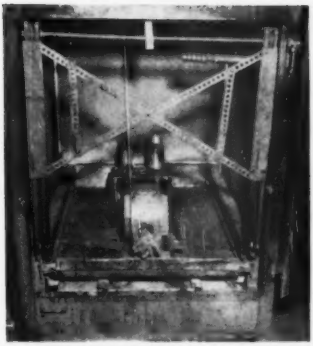
LOADED TRAY is pushed into small electric oven enclosure. Tray is suspended on hinged track extension when pulled out.

HINGED TRACK extension is folded up into oven enclosure after tray is in place.

which ride on angle-iron or channel-iron "rails."

Krauth's design differs from others in that the tray is *suspended* by "rollers" from parallel tracks made from sections of conventional overhead garage door channel. And the track extension folds up into the oven enclosure leaving the aisle area in front clear of any obstructions. Two 29-inch lengths of the door channel extend beyond the oven enclosure; are hinged to the oven track at a point about four inches inside the oven to permit closing of the door. The parallel "tracks" are supported 26 inches above floor level by two iron "T" legs pin-hinged at the channel ends. Perforated-iron cross bracing holds the legs rigid in both open and closed positions.

When the oven is to be loaded with parts, the track extension is lowered and the tray pulled out full length. After the tray is loaded, it is pushed

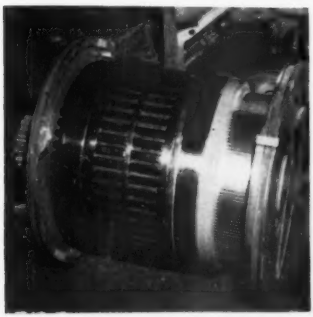


LOCKED IN PLACE inside oven is hinged track. Design provides sufficient clearance to close oven door tightly.

into the oven and the supporting extension folded up and locked in place. The oven door is closed and everything is ready for the baking operation. As a result, there is a clear path to the large, adjacent walk-in oven and the score for scratched legs and knicked shins is zero.

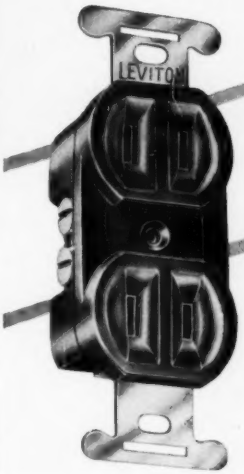
Stainless Steel Armature Banding

The bugaboo of armature banding wire loosening and becoming fouled is eliminated by a practice developed by the Electric Manufacturing and Repair Company, Pittsburgh, Penna. There, when desired, the banding takes the form of stainless steel non-magnetic straps, with welded joints holding the straps tightly and positively. Straps are wrapped around the armature and are tightened by encircling bands fitted with turnbolts to obtain the desired tension. While so held, the bands are welded and are finally ground down to a smooth exterior. As completed, the weld is scarcely noticeable, the bands are installed quickly, and the holding action is guaranteed.



WELDED JOINTS are imperceptible after stainless steel armature bands have been installed and tightened.

... newly designed!



double sided contacts and underslung plaster ear strap

duplex receptacle

parallel slotted

no. 5030

*... another **heavy duty** product in the **5000 Series***

Rated: 10 A.-250V ; 15 A.-125V.

Sturdy assembly with underslung strap. Heavy gauge phosphor bronze contacts. Twin large head 8–32 terminal screws. Both sides of plug cap blades in contact.
Good for lifetime of plug-ins
Approved by users everywhere

LISTED AS STANDARD BY UNDERWRITERS LABORATORIES, CANADIAN STANDARDS ASSOCIATION. MEETS R.E.A. SPECIFICATIONS.

for **Heavy Duty** jobs use the **Leviton 5000 Series ...**

LEVITON

LEVITON MANUFACTURING COMPANY
BROOKLYN 22, NEW YORK
warehouses: Chicago and Los Angeles

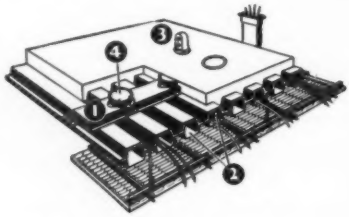
OFFICES IN ALL PRINCIPAL CITIES

Prepared for Unforeseen Electrical Expansion

WITH

G-E Q-FLOOR WIRING

Q-Floors are installed easily and quickly. They become working platforms. With G-E Q-Floor wiring, the floor is the raceway system. Each floor cell is a complete raceway, ready for wiring, ready for electrical changes any time during the life of the building.



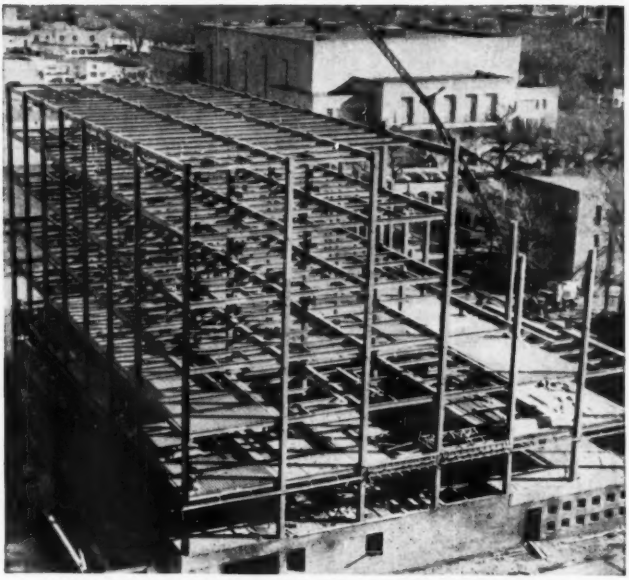
G-E Q-Floor Wiring System Means Electrical Flexibility—

1. Header duct—at right angles to Q-Floor—carries wire from load center to cells.

2. Cells serve as raceways for power, signal, and telephone systems.

3. Floor outlets are installed by drilling Q-Floor cells at any point.

4. Junction units in header duct permit easy access to wiring at any time.



SOUTHWESTERN BELL TELEPHONE COMPANY BUILDING, TOPEKA, KANSAS

Architect—Stookey and Howells, Topeka; *General Contractor*—M. W. Watson, Topeka; *Electrical Contractor*—Shrake Electric Co., Topeka; *Owner*—John R. Peach, Topeka

The farsighted designers of this building leased by the Southwestern Bell Telephone Company have specified General Electric Q-Floor wiring for complete electrical flexibility—now and in the future.

Predicting future requirements of an electrical system is difficult, yet today's power, telephone and signal circuits must be adaptable to tomorrow's layout changes. For adaptability make this provision for changes in the blueprint stage. Plan to meet *all* unforeseen electrical expansion with G-E Q-Floor wiring.

This built-in raceway system provides for the placement of new or relocated power and communications outlets within six inches of any point on the floor—at any time during the life of the building. To add a new outlet, simply drill a hole through the top of the raceway cell . . . wire the outlet . . . and set it into place. Outlets can be removed just as easily when they are no longer needed. And, the job can be done so quickly, normal operations continue undisturbed.

Check the versatility of G-E Q-Floor wiring, yourself. See how it keeps commercial, industrial, and institutional buildings electrically young. For complete information and a free copy of the Q-Floor Wiring Data Manual call your nearest G-E district office. Or, write Section C61-1018, Construction Materials Division, General Electric Company, Bridgeport 2, Connecticut.

You can put your confidence in—

GENERAL ELECTRIC

More Information About NEW PRODUCTS CATALOGS, BULLETINS ADVERTISEMENTS

Here's a service which meets your needs for information.

Here's how to get manufacturers' information as ***QUICKLY*** as possible.

FOR QUICK ACTION USE THESE CARDS

Describe the product or literature in the space provided. Use trade-names, name-plate data, bulletin numbers and titles, etc. Give the number of the page on which the item is mentioned, and fill in the month of the issue.

Address the reverse side of the card to the manufacturer concerned.

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on Page....in the.....issue of Electrical Construction and Maintenance.

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ADDRESS .....

CITY .....STATE .....

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The Editors

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Electrical Construction and Maintenance is written for you by a large staff of editors and consultants, each an authority on some phase of the business. They will be glad to give you expert advice and answers to your questions.

Do you have a problem in wiring layout, motor control, lighting methods, code interpretation? For sound technical advice

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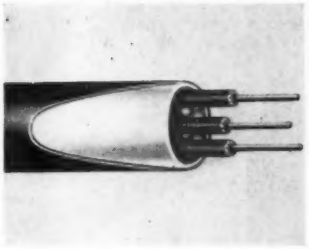
Product News

Switch (1)

A redesigned master switch featuring a new cast-aluminum cover and up to five adjustable stops has been announced. For heavy-duty installations, the dustproof switch will find application on large materials handling equipment such as steel mill type cranes. The cover offers protection for the switch interior from dust, dirt, and accidental blows. It is easy to remove for inspection and normal servicing of switch interior. Adjustable stops on switch provide for any combination of from one to five points of movement of operating handle in either clockwise or counterclockwise direction. Standard equipment includes a ball and rod handle, but four other types of operator are also available. Switch is interchangeable in size and mounting with former G-E types.

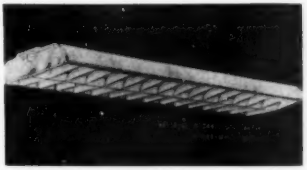
General Electric Company, Schenectady 5, N. Y.



Conduit (2)

Announcement has been made of a new plastic armored electrical metallic tubing for use where corrosive atmospheres necessitate frequent replacement of electrical conduit. The new Dekoron conduit is made by the Company's patented extrusion process. A .020-inch coating of corrosion-resistant vinyl or polyethylene plastic is extruded over standard galvanized electrical metallic tubing. By varying the thickness and composition of plastic armor, conduit can be given any desired dielectric properties. Standard compression type couplings and connectors wrapped with electrical insulating tape are used at joints. If desired, plastic coating can be applied over standard rigid conduit instead of galvanized electrical tubing.

Samuel Moore & Company, Mantua, Ohio



Lighting Fixtures (3)

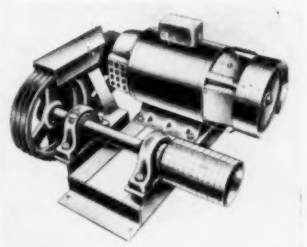
Announcement has been made of a new, engineered series of fluorescent and slimline commercial luminairies. Illustrated is the No. H-244 for two 40 watt lamps, also available for four 40 watt lamps or two 85/100 watt lamps. This same series is available in the 96 inch slimline size, for two or four lamps operating at 200 or 430 ma, and for two or four 48 inch lamps operating at 430 ma only. Supplied with either luminous metal or plastic side panels, these units are ideal for commercial installations and for schools and institutions where high light output and low surface brightness are desired.

Keystone Electric Manufacturing Co., 2228 E. Tioga St., Philadelphia, Pa.

Synchronous Motor (4)

A new small synchronous motor has been announced. The motor, operating on the reluctance principle, has no brushes, slip rings, rotating coils or permanent magnet. It can be built to operate continuously at any voltage below 250 volts, either single phase or polyphase. A typical motor is 4 inches in diameter by $2\frac{1}{8}$ inches long, weighs 2.6 pounds, and develops 8 ounce-inch starting torque and 0.8 ounce-inch synchronous torque. No starting equipment is required, motor being able to start and pull into step at any frequency from 10 to 400 cycles.

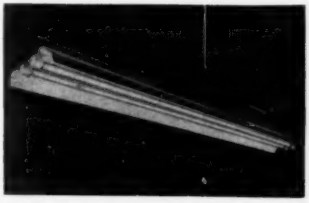
Allis-Chalmers Manufacturing Co., Milwaukee 1, Wis.



Generator (5)

A new stand-by ac power insurance generator has been introduced. Powered by the farmer's tractor, this unit can be put into operation in just a few minutes time in the event of interruption of electric power line service. It provides a continual source of power for electric pumps, lights, refrigerators, automatic furnace, bathrooms, and a multitude of other farm and home appliances. It is built with sealed ball bearings in the generator and ball bearings on the jack shaft. It has a normal output of 3000 watts at either 115 volts or 230 volts; with a starting load capacity of 5000 watts, which can also be utilized for other intermittent uses, such as for operating welding equipment.

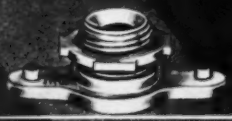
Wincharger Corporation, Sioux City, Iowa



Industrial Fixture (6)

Announcement has been made of new and improved Slimline industrial lighting fixtures. They are adaptable for single or continuous run installation. Reflector is removable for access to wireway channel. Unit has heavy gage, one-piece steel housing and reflector. Wireway channel is finished in gray. Reflector is finished in baked white enamel. Unit available in two and 4 lamps, 96 inches long, and in both 200 ma or 430 ma.

Apollo Lighting Fixture Co., Inc., 214 S. Fourth Ave., Mt. Vernon, N. Y.



midwest

MODERN FITTINGS FOR

- thinwall conduit
- rigid conduit
- metallic and non-metallic cable
- flexible steel conduit
- service entrance cable
- grounding devices
- lighting fixture fittings

Representatives in Principal Cities

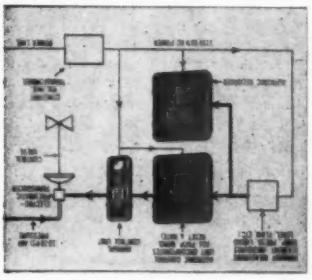
Sold Through Electrical Wholesalers

midwest electric mfg. co. • 1639 walnut st. • chicago 12, ill.

Communication System (7)

A new intercommunication system, combining features of the master-selective and deluxe models, and adaptable to a wide range of uses in industrial installations, offices, stores, factories and institutions has been introduced. The new CL series offers a flexible combination from which incoming calls may be answered from a distance of up to 40 feet from any master station or substation, and in which master stations may talk with each other, substations may be called selectively, or exclusively to any master station, and any master may be used privately or non-privately at its own option. This series is designed for systems requiring operation of more than one master station along with substations. CL-5 is a combination system for five station use, and CL-10 for ten stations.

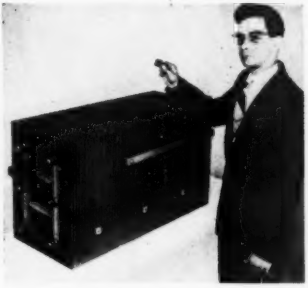
Talk-A-Phone Co., 1512 S. Pulaski Rd., Chicago, Ill.



Control System (8)

Announcement has been made of a new automatic all-electronic instrumentation and control system for use in chemical and food processing plants, refineries, petrochemical installations, industrial power plants and central stations. Known as the Autronic control system, it consists essentially of three basic units: Primary sensing element, Autronic control unit, and final control element. System is powered by 115 volt 60 cycle ac. Primary sensing element generates a voltage which is directly proportional to any change in the process variable. Unit can be mounted at any convenient location so that all adjustments can be made at the graphic panel or central control point. It incorporates calibrated adjustments for proportional band, reset, and rate time (derivative). Unit can be furnished with or without set-point adjustment and scale.

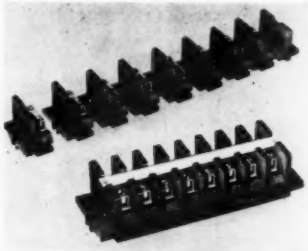
Swartwout Company, 18511 Euclid Ave., Cleveland 12, Ohio



Conversion Units (9)

New, custom-made ac to dc rectifier power conversion units of high current and voltage capacities have been announced. This new development is made possible by the manufacture of extra large selenium rectifier cells by a new vacuum process. The use of these larger cells permits the use of fewer parallel elements for a given dc output and at the same time keeps the weight to a minimum.

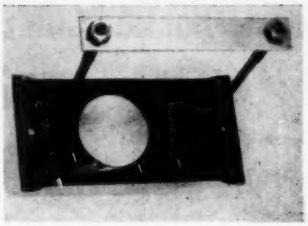
Syntron Company, 690 Lexington Ave., Homer City, Pa.



Solderless Connector (10)

Announcement has been made of new Add-A-Point terminal blocks with simplified solderless connectors. They will accommodate standard wire sizes from No. 14 to No. 6. Blocks are rated up to 60 amperes and will operate safely up to 750 volts. Each unit consists of a one-piece point and barrier, an end piece, marking strip and short screws. No through bolts, long screws or individual barriers are used.

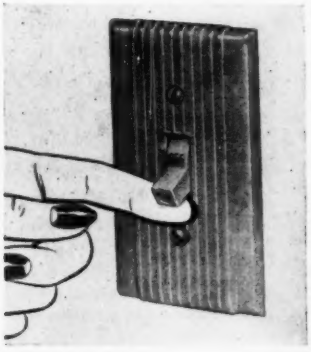
The Wama Company, Industrial Building, Baltimore 2, Md.



Meter-Base Mount (11)

Announcement has been made of a new meter-base mount to facilitate the mounting of an outdoor meter socket to the wall of a brick veneer or stone veneer dwelling. It cuts the cost of installing a meter socket in half and assures a secure mounting preventing meter socket from becoming loose or falling from wall. It is manufactured from 16 gage steel and is equipped with two elongated rods and a gage plate for assuring a constant center-to-center distance between the bolts which is equal to the center-to-center distance of the holes in back of a meter socket. It has an oversize hole in the base plate for the entry of conduit or service entrance cable in the back knock-out of a meter socket.

Thomason Products Company, 4630 Beverly Drive, Dallas 5, Texas



Wall Plate (12)

Availability of the new "Uniline" wall plate design has been announced. Units are being supplied to accommodate single, duplex and multiple wiring devices of both regular and interchangeable-line types. All wall plates are molded from brown Bakelite or Ivorylite. They are easy to keep clean and are said to harmonize with all interiors. Reinforced backs provide extra rigidity.

Arrow-Hart & Hegeman Electric Co., 103 Hawthorn St., Hartford 6, Conn.

CUSTOMERS COME *FIRST* WITH

TRADE ARRO MARK

Once again, steel and other vital defense materials are subject to increased demands.

And once again, Government controls, although well-meant, are confusing both supplier and user.

Black Markets, hoarding and illegal prices further complicate the picture . . .

BUT

with Arro—customers come first! Arro Expansion Bolt Company will have no part of illegal or underhanded practices . . . further, Arro is cooperating, to the fullest extent with the Defense Program. Within the limitations of raw material regulations and Government restrictions, we will continue to give Arro customers the best service possible. Quality has not—and will not be sacrificed. We will continue to make prompt deliveries.

CUSTOMERS COME FIRST WITH ARRO

MANUFACTURING A COMPLETE LINE OF ANCHORING AND DRILLING DEVICES FOR MAKING FASTENINGS TO MASONRY—FOR 20 YEARS.

Sold Only Through Distributors

ARRO EXPANSION BOLT CO.
MARION, OHIO

Circuit Recloser (13)

The Kyle Type E oil circuit recloser is a single-phase unit which provides self-contained protection against temporary or permanent line faults, on nominal 23 kv systems. It provides three consecutive automatic reclosing operations, or four openings, including the final lockout operation, and employs a single series operating coil which provides energy for the opening, closing and timing functions of the recloser. Protection is provided to circuits with load currents up to 100 amperes, and fault currents up to 1500 amperes. Timing of all operations is controlled hydraulically. Type E will coordinate in series, and branch line fuses can be coordinated with it for selective blowing in same manner as with other Kyle reclosers.

Line Material Company, Milwaukee 1, Wis.

Panelboard (14)

Distributor stocking and "Off-the-Shelf" delivery of circuit breaker distribution panelboards is now possible with this new type MHP "plug-in" distribution panelette. Standard 120 and 240 volts ac circuit breakers from 15 ampere to 100 ampere, 1, 2 and 3 pole, are plugged onto silvered bus bars to complete the desired circuit arrangement. Thermal-magnetic, two-way protection is provided by circuit breakers used in panelettes. Thermal trip element holds momentary overloads but trips if overload continues. Magnetic trip element functions instantly on both moderate and heavy "shorts". Four standard basic devices are available. The single row, 200 ampere mains panelette has 4-inch wiring gutters on all sides; the double row, 400 ampere mains has 4-inch side gutters and 6-inch end gutters. They carry Underwriters' Laboratories approval.

Square D Company, 6060 Rivard St., Detroit 11, Mich.

Fluorescent Fixture (15)

A new fluorescent fixture for use over inspection and assembly benches has been announced. Cataloged as No. 8151 bench light, it is available in 4-foot and 8-foot lengths for one 40-watt T-12 lamp per four-foot length. A parabolic reflector of specular Alzak aluminum provides high levels of evenly distributed light over the entire working area. Mounting holes and knockouts are provided so that the units may be mounted directly to the underside of shelves above the benches or suspended from stems or chains.

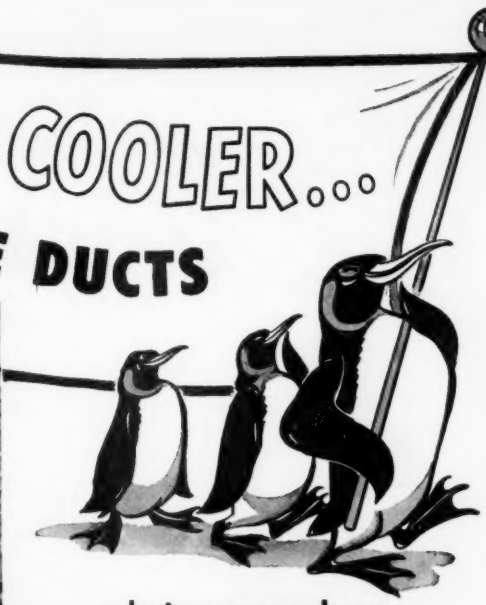
Garden City Plating & Mfg. Co., 1750 North Ashland Ave., Chicago 22, Ill.

Cord Set (16)

A new 8-foot cord set with grounding plug to meet the new NEMA standard has been announced. This set has a molded-on plug with a special round pin to provide positive third-wire grounding. The grounding pin is an integral part of the plug that requires no secondary operation of attaching grounding lead or strap. Contacts are heavy-duty tinned solid brass and conductors are No. 16 AWG, stripped for ease of installation. Jacket is ribbed-finish 3/16-inch Type SJ rubber.

General Electric Company, Bridgeport, Conn.

Cables run COOLER...
in TRANSITE DUCTS



... reducing copper losses
... increasing current capacity
... prolonging insulation life

YOU REDUCE copper losses . . . increase current carrying capacity . . . and prolong insulation life, when you run your cables in Transite* Ducts.

Current carrying capacities can be increased in a typical duct bank as much as 5%, or 1^2R losses can be reduced 11%, for cables located in Transite as compared with other ducts used for power circuits.

And, Transite Ducts assure permanent duct banks because Transite is incombustible; is immune to rust and rot; is unaffected by electrolysis; will not slag under action of an arc, and will retain its high original strength.

An unusually smooth bore assures no injury to cable sheath, either in natural movement under load, or when pulling-in cables. Long, lightweight lengths can be quickly and economically installed. In addition, a full line of fittings simplifies even the most complicated of installations.

For full information on Transite Ducts, write for Data Book DS-410. Johns-Manville, Box 290, New York 16, N. Y.

*Reg. U. S. Pat. Off.

How Transite Ducts increase current carrying capacities

Type cable 3 cdr. 500 MCM Compack Sector, 15 KV (6th Edition AEIC Spec.)
No. of cables—3 (all loaded in one bank)
Daily Load Factor—75%
Earth Temp. ambient—20 C.

	Transite	Other
Total Therm. Res. to Dielectric Loss (C watts/ft.)	5.66	6.17
Total Therm. Res. to Copper Loss (C watts/ft.)	4.44	4.95
Temp. Rise from Dielectric loss (C)	1.9	2.1
Allowable Rise for Copper loss (C)	59.1	58.9
Allowable Watts per ft. cable	4.44	3.96
Allowable Current—(Amps. per cdr.)	386.	365.
Allowable Current—(Relative %)	105.6	100.

Johns-Manville *Transite Ducts*

TRANSITE KORDUCT—for installation in concrete

TRANSITE CONDUIT—for exposed work and installation underground without a concrete encasement

make PAINE your first choice

toggle bolts

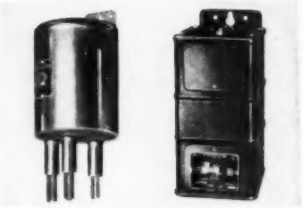
Constant efforts to satisfy the numerous Fastening and Hanging tasks have resulted in Paine's "know how." Do as others have done—make Paine *your* first choice.

Paine Spring Wing Toggle Bolts provide a secure and permanent fastening in hollow walls and ceilings, where it is impossible to reach the other side. Reduce installation time and accent the quality of your work with Paine Spring Wing Toggle Bolts.

THE PAINE COMPANY 2961 Carroll Ave., Chicago 12, Ill.

the best craftsmen always take PAINE'S

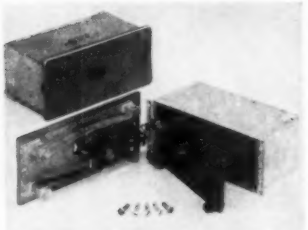
Spring Wing Toggle Bolts	Conduit Clamps	Star Drills
Expansion Anchors	Pipe Hooks and Straps	Malleable Shields
"Sudden Depth" Drills	Hanger Iron, perforated	Special Hanging and
Wood Screw Anchors	Expansion Shells	Fastening Devices



Transformer (17)

A revised line of transformers for indoor and outdoor operation of mercury vapor (H-1) lamps has been announced. The line of indoor transformers consists of single and two lamp units—normal and high power factor—available for 115 and 230 volt circuits. The line of outdoor transformers lists aerial, pole top, pole base and vault types for boundary lighting, building exterior lighting, parking and shipping area illumination. The aerial mounting type can be converted for pole top installation by means of an adapter that will fit any pole top from 2 to 4½ inches in diameter.

Jefferson Electric Company, Bellwood, Ill.



Thermostat (18)

A new thermostat, Glassheat Radiantrol, designed for application to radiant glass panel heating systems has been announced. It is designed to be sensitive to the proper air temperature and radiant heat balance. Radiantrol plate is mounted flush to the wall with all moving parts behind the plate. Operation is provided by expansion of the plate differentially with invar control bars. Switch contacts and mechanism are rated at 5,000 watts. It can, without relays, control up to four Glassheat panels. Unit is equipped with its own junction box. This box should be installed horizontally in the wall approximately four feet above floor level. Listed by Underwriters' Laboratories.

Continental Radiant Glass Heating Corporation, 1 East 35th Street, New York 16, N. Y.

Control (19)

The Baldor adjustable-speed motor system is fundamentally a Ward-Leonard system of speed control for operation from polyphase or single phase ac circuits. The system consists of three units: a motor-generator set, a controller, and a drive motor, any of which may be mounted any distance from the others and in any position. A single controller provides 16 forward and 16 reverse steps of speed adjustment of 150 rpm each to a total of 2400 rpm and provides full dynamic braking. A vernier rheostat may be connected in the circuit if finer adjustment is required. Glass insulation is used where practical. Excitation is by a full-wave rectifier of the Tungar type. Sizes are ½ hp through 4 hp for operation from polyphase circuits and ¾ hp through 1½ hp for operation from single phase circuits.

Baldor Electric Company, 4353 *Duncan Ave., St. Louis* 10, *Mo.*

Infrared Brooder (20)

A new type of infrared chick and poultry brooder is now being produced. It is designed to meet the needs of both large and small brooding operations. Basic fixture is made of rust-resistant metal and has a horizontal diameter of 15 inches. It is equipped for four 250-watt R-40 lamps. Lamps are set at an angle to give infrared rays widest spread. Brooder forms a radiant energy pattern of sufficient area to brood a flock of from 300 to 500 chicks. Available in two models—CB-30 for use in individual brooder for either small or large operation. It is equipped with Waffer thermostat control, 4 infrared lamps, suspension chain and drop cord. CB-20 is for use in conjunction with larger brooding operation where one thermostat controls entire house. Comes equipped with four infrared lamps and suspension chain but without thermostat and drop cord.

LML Engineering & Manufacturing Corp., Columbia City, Ind.

"Let me tell you why

My Men Want BLACKHAWK Benders . . ."

PROOF that today's No. 1 Bender Line saves time, saves money!

"MY MEN LOVE THAT REMOTE CONTROL! With the hydraulic pump and ram separated by a flexible hose, a man can move around — 'jockey' the pipe with one hand — sight along it if necessary . . . without stopping the pumping."

"IT'S JUST PLAIN HANDIER and a Blackhawk costs me nothing extra. Works in any position—on its side or upright — on table or floor — on existing runs. So naturally, I give my men exactly what they want to make their job easier and cut my own costs on both rigid and thin-wall conduit."

AND IF YOU WANT TO MOTORIZE your hydraulic equipment, the inexpensive P-182 portable electric pump provides fingertip control, cuts manual labor, triples output. Especially effective for repetitive bends or heavy pipe. Remember, too—Blackhawk hydraulic units can be detached to lift machinery, pull pulleys or for other allied jobs.

WRITE FOR THESE NEW BOOKS — 50B and P50! They describe the remarkable, low-cost "Porto-Power" hydraulic units — the popular Benders S30A, S36 and S34 — also the amazing new hydraulic Knock-out Punches that are 60% faster.

CLIP THIS COUPON AND MAIL TODAY!

BLACKHAWK MFG. CO.
Dept. P-20111, Milwaukee 1, Wis.

Rush free Catalogs 50B and P50 on Blackhawk Electrician's Equipment.

Name .....

Firm .....

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City ..... Zn ... State .....

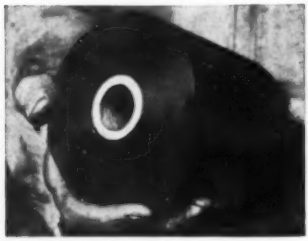
BLACKHAWK
HYDRAULIC *Porto-Power* EQUIPMENT

MIDWEST UTILITY COMPANY PROVES IT ON BURIED HIGH-VOLTAGE CONDUCTORS...

Plastic tape knocks the tar out of tough coating jobs!

Hazardous, hard-to-handle hot tar coatings are a thing of the past now that plastic-backed "SCOTCH" Electrical Tape No. 22 protects buried conductors against corrosion. A midwest utility company recently completed installation of 1¼ miles of underground high-voltage pipe type cable, and the entire surface of three inch copper risers was given safe, dependable protection with this tough tape. Galvanic action, earth acids, bacteria and fungi are sealed out.

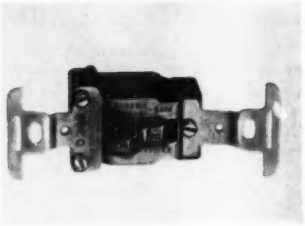
On every kind of job, small or large, "SCOTCH" Electrical Tape No. 22 can cut your costs, save you time without the messiness and danger of hot coatings. Patching and repairing are easier, too! No activator is needed for the specially developed pressure-sensitive adhesive. It sticks at a touch and holds dependably. See your jobber today.



WIDE ROLL of "SCOTCH" Electrical Tape No. 22 covers large areas quickly. Tape is also available in 36-yard rolls and in widths of ½, ¾, 1 and 2 inches. Contains no sulphur bearing compounds. Application three times faster than conventional materials.

REG. U. S. PAT. OFF.
SCOTCH
BRAND
Electrical Tape
No. 22

The term "Scotch" and the plaid design are registered trade-marks for the more than 100 Pressure-sensitive adhesive tapes made in U.S.A. by MINNESOTA MINING & MFG. CO., St. Paul 6, Minn.—also makers of "Scotch" Sound Recording Tape, "Underseal" Rubberized Coating, "Scotchlite" Reflective Sheeting, "Safety-Walk" Non-Slip Surfacing, "3M" Abrasives, "3M" Adhesives. General Export: Minnesota Mining & Mfg. Co., International Division, 270 Park Avenue, New York 17, N. Y. In Canada: Canadian Minnesota Mining & Mfg. Co., Ltd., London, Ont.



Switch **(21)**

Announcement has been made of a new EDCO delayed action light switch. It provides full light for exit after switch has been turned off. Shuts light off automatically a minute later. It is quickly and easily installed in any standard wall switch opening. For use in the home, business and industry and on the farm. Molded parts are bakelite and neoprene. Stampings and screws are yellow brass, phosphor bronze and cadmium plated steel. Flush toggle—single pole. Capacity 10 amps at 125 volts, 5 amps at 250 volts. Approved by Underwriters' Laboratories, Inc.

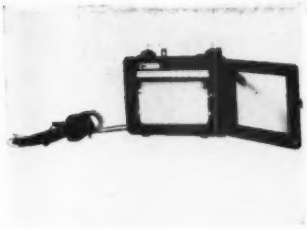
Electric Deodorizer Corporation, 9993 Broadstreet, Detroit 4, Mich.

Emergency Lighting Unit **(22)**

Insurance against light failures in large and small buildings is provided by the Exide Lightguard emergency lighting unit. Each unit is about the size of a portable typewriter, consisting of one or two 25-watt sealed beam floodlights with power supplied by a thick-plate glass jar storage battery. A magnetic switch automatically connects the floodlights to the battery when the normal current is interrupted. When the unit is not in use, its battery is kept fully charged from the regular electric circuit, since it is always plugged into an outlet. When normal power service is restored, a relay automatically turns off the floodlights and turns on the charging unit. It is said to illuminate 4,000 square feet of floor area. Lamps are adjust-

able to provide light in any direction desired. It is for use in restaurants, factories, schools, hospitals, theatres, office buildings and other public gathering places.

Electric Storage Battery Company, Philadelphia, Pa.



Instrument (23)

A new TAG recording ammeter used portably with a Weston clamp-ammeter unit Model 633, Type AIR-A2R, is now available for measuring and recording ac without breaking the circuit. Records obtained can reveal proper or improper handling of plant equipment, detect unwarranted use of power, and discover unnecessary waste of production line time by checking the starting and ending time of operating equipment. Unit can be used for making rapid ac measurements on either insulated or non-insulated conductors. It functions on the magnetic induction principle. Clamp pick-up, which has terminals and a range selector switch on the face of instrument instead of a dial, is well compensated for temperature variations.

Tagliabue Instruments Division, Weston Electrical Instrument Corp., 614 Frelinghuysen Ave., Newark, N. J.

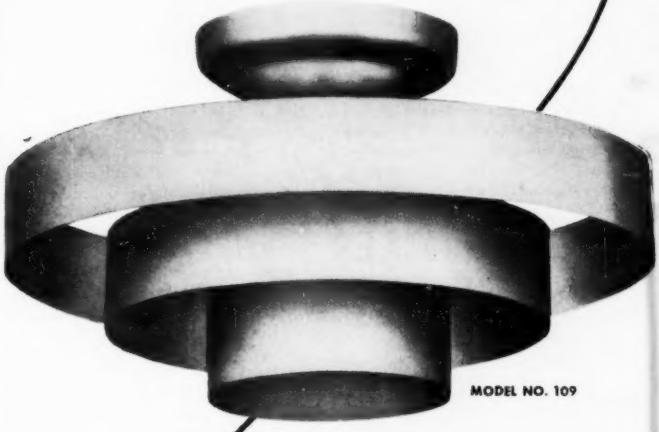
Floodlight (24)

Announcement has been made of a new Series 306 floodlight. Holder is weatherproof cast aluminum. Holder permits rotation of lamp to any fixed position for positive adjustment. They are adaptable to cluster mounting—5 lights per circuit giving 500,000 beam candlepower. Available in both narrow and wide beam. Unit measures 7½ inches in diameter by 7½ inches deep. It uses 300 watt PAR 56 sealed beam type lamp. Units are used for general and special building lighting, parking lots, protective lighting, outdoor theatres, service stations, recreation fields, etc.

Shalda Mfg. Co., 835 South San Fernando Blvd., Burbank, Calif.

exclusive with LITECRAFT

the only TEN INCH concentric louvered unit on the market!



MODEL NO. 109

Diameter: 10"—overall length 8"—
Lamp: For use with 40W to 100W—
Finish: Chrometone, sprayed and infra-red baked.

Low in Price... High in Efficiency... 100 Watt Maximum

This modern, all-purpose fixture—with a 10" diameter—is Litecraft's "model" of versatility... features the twin values of *economy* and *service* plus "modern design."

Specified for corridors—vestibules—hallways—lavatories—stairways.

Ideal for stores, schools, homes, office buildings, etc.

Distributed Nationally Through Electrical Wholesalers.

RETURN COUPON TODAY FOR FREE BULLETIN #9B

LITECRAFT MANUFACTURING CORP.
790 Wythe Ave., Brooklyn 11, N. Y.
For *complete* information on Litecraft's complete line of concentric louver units simply fill out and return this coupon.

Name_____
Firm_____
Address_____
City_____
Zone_____ State_____

The ONLY Soldering Tool You Need for light or HEAVY Work!

Switch *instantly* from light to heavy work—or vice versa—with the 250-watt Weller Soldering Gun. *Controlled* dual heat makes the Weller Gun the only soldering tool you need for *all types* of work. 5-second heating saves time and current on every job, too. Your Weller Gun pays for itself in a few months!

250-Watt WELLER SOLDERING GUN

√ Check these exclusive features

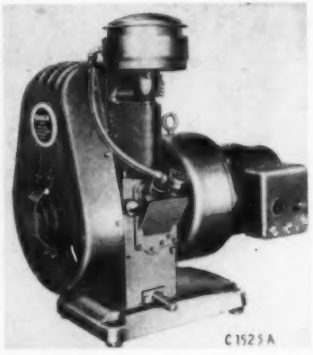
- **TRIGGER-SWITCH CONTROL**—Governs heat and saves power because no need to unplug gun between jobs. Heat goes off when you release trigger.
- **5-SECOND HEATING**—No waiting, no wasted current. Saves hours and dollars each month.
- **SOLDERLITE**—Spotlights the work. Lets you see what you're doing at all times, even in dark corners.
- **LONGER REACH**—Lets you get at any job with ease. Slides between wiring, into the tightest spots.
- **STREAMLINED**—Compact and comfortable to hold. Pistol-balanced for fast precision soldering.
- **WELLERTIP**—Rigid and chisel-shaped with more area for faster heat transfer. Over/under terminals brace tip, give greater visibility.
- **DUAL HEAT**—Single heat 200 watts; dual heat 200/250 watts; 120 volts; 60 cycles.

See the all-purpose Weller Soldering Gun today at your distributor—or write for bulletin direct.

SOLDERING GUIDE—Get your new copy of SOLDERING TIPS—revised, up-to-date and fully illustrated 20-page booklet of practical soldering suggestions. Price 10c at your distributor, or order direct.

WELLER ELECTRIC CORP.

815 Packer Street, Easton, Pa.



Electric Plant (25)

A new 3000 watt Diesel electric plant, powered by an air-cooled full-Diesel engine has been announced. Push-switch control for electric cranking, manual compression release, and an electrically heated glow-plug for cold weather starting are provided. Plant is driven by an improved four cycle single cylinder Onan DSP Diesel engine which incorporates many new engineering features. Approximately 0.155 gallon of low-cost furnace oil is consumed per kilowatt hour at full rated load. Unit generates 115 volt, 60 cycle, single phase current. Other ac models available in single-phase produce 230 volts and 115/230 volts.

D. W. Onan & Sons, Inc., University Ave. S.E. at 25th, Minneapolis, Minn.

Limit Switches (26)

Announcement has been made of the addition of two new actuators to the Type "ML" Micro-Limit line of heavy duty precision limit switches. Model 2ML1 has a straight plunger actuator and 5ML1 has a roller-plunger actuator. The roller-plunger actuator is adjustable 90° in either direction to place the roller in line with the actuating force. 2ML1 measures 2-1/8 inches by 6-11/32 inches by 2-3/16 inches and the 5ML1 is 2-1/8 inches by 7-5/32 inches by 2-3/16 inches. Underwriters Laboratories list the Type "ML" switches for 20 amperes, 110, 220 or 460 volts ac; ½ amp, 115 volts dc; ¼ amp, 230 volts dc; ¼-hp 220 volts ac.

Micro Switch, Freeport, Ill.

Dimmers (27)

This line of packaged powerstat dimmers has been redesigned. Assemblies of the 2000 watt series are now available in packages of 3, 4, 5 and 6 unit dimmers. Each assembly is housed in grey finished cabinet. Individual dimmers are operated by vertical hand levers with graduated drums. These levers can be interlocked for master control from one lever. Each dimmer has its own on-off switch and circuit-breaker, card holder for circuit identification and pilot light. Standard output connectors include a terminal board for solid connection; pin-jack receptacles for single prong or two prong plugs; parallel blade receptacles and twist-lock type receptacles. Dimmers can be operated from two wire 1 phase, three wire 1 phase and four wire 3 phase ac power lines.

Superior Electric Company, Bristol, Conn.

Starter (28)

A new type starter, basically a fused high-capacity interrupter switch, is now being used on all models of Type WD-42, -43, and -44 motor generator dc arc welders. New starter provides positive motor starting because contacts are locked in by mechanical action. A direct-acting lever physically closes or opens the contact when it is operated. A time-delay

Designed for Contractors by Wakefield

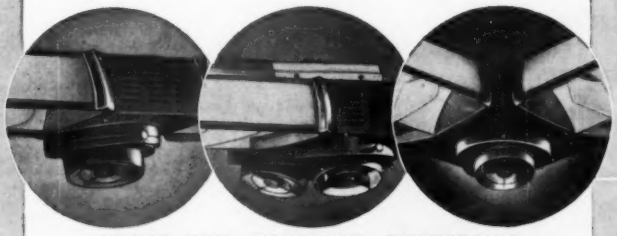
The Grenadier is a "Family" of Fixtures

. . . to meet varied requirements yet maintain a uniform appearance

No matter how difficult the installation looks, it's no trouble at all to get the right amount of light where you want it with matching units from the Grenadier Family. They're available for two or four slimline or bi-pin lamps, for four or eight foot units or continuous runs; with spots if desired; in five types of mountings. And each unit is designed for easy, one-man installation to save time, save labor, and give your customer an economical job.

Wide-awake contractors don't say, "Hang the expense!" They say, "Hang Wakefield!"

The F. W. Wakefield Brass Company • Vermilion, Ohio



SPOTS FOR WAKEFIELD GRENADIERS

Wakefield Over-ALL Lighting

GRENADIER STAR COMMODORE WAKEFIELD CEILING

"VITAL STATISTICS" of the Grenadier Family

4′ units for two 40-watt bi-pin lamps

4′ units for two 36-watt slimline lamps

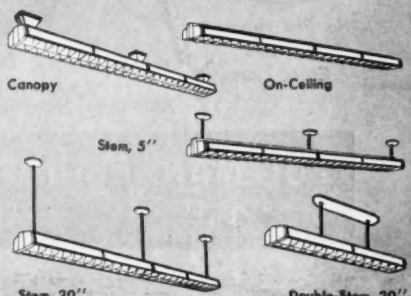
8′ units for two 72-watt slimline lamps

4′ units for four 40-watt bi-pin lamps

4′ units for four 36-watt slimline lamps

8′ units for four 72-watt slimline lamps

MOUNTINGS



Canopy

On-Ceiling

Stem, 5″

Stem, 20″

Double-Stem, 20″

FULLMAN Latrobe PRODUCTS

FLOOR BOXES WIRING SPECIALTIES

Products that Save and Serve

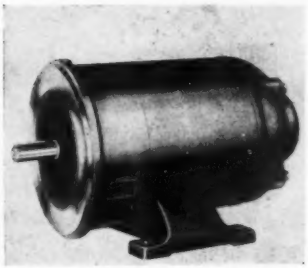
"Latrobe" Floor Boxes and Wiring Specialties save time and money because they are quickly and easiily installed. They serve long and well because they are made of finest materials.

No. 252-R "Latrobe" Two Gang Adjustable Box
No. 110 "Latrobe" Non-Adjustable Watertight Box
No. 280 Nozzle, No. 200 Cover Plate
Fullman
"LATROBE" PRODUCTS
Supreme Quality
No. 284 Nozzle, No. 200 Cover Plate
Keystone Fish Wire
No. 150 Box— No. 207 Nozzle
Sold Only Through Wholesalers

FULLMAN MANUFACTURING CO.
LATROBE . . . PENNSYLVANIA

fuse connected directly in the line protects the motor circuit from overload. This time-delay feature enables the fuse to carry harmless overloads and starting circuit inrushes, as well as providing motor-running and branch circuit over-current protection, as permitted by Section 4346 of the Electrical Code. Starter is mounted on end panel of welder control box, which has been redesigned to allow easy access to fuse and connection terminals.

General Electric Company, Schenectady 5, N. Y.



Motors (29)

A new line of NEMA "C" face mounted, integral hp motors has been introduced. Built in standard NEMA frames, these units are offered in single phase, integral hp ratings through 3 hp, 3450 rpm and in polyphase, integral hp rating through 5 hp, 3450 rpm. Two basic varieties are available: horizontal and vertical. Both are drip-proof, equipped with heavy-duty ball bearings and suitable for continuous-duty operation on applications such as water pumps, machine tools and any other general-purpose application suitable to face mounted motors. Special features include single-phase units, a totally enclosed dust-proof, dirt-proof external switch housing; and also condensers mounted within the motor base.

The Hoover Company, Chicago, Ill.

Controller (30)

The new Regutron magnetic amplifier control is used with the adjustable-speed magnetic drive, and electro-magnetic torque transmitting device which gives variable speed output when used in combination with a constant speed motor. A saturable core reactor amplifier system using non-moving parts accomplishes the precise, stepless control of speed to within plus or minus 0.5% of speed called for. This hairline sensitivity is obtained

through a current amplification ratio of approximately 20,000 to 1. The drives are built in ratings of 25 hp and higher in the usual motor speeds. They are applied to loads such as fans, centrifugal pumps and centrifugal compressors.

Electric Machinery Mfg. Company, Minneapolis 13, Minn.

Storage Battery (31)

Announcement has been made of additions to the Silvercel line of miniature, silver-zinc storage batteries. Group is comprised of Models Nos. 20 HR-15, 20 HR-GS and 20 HR-BS, all of them equipped with heavy, screw-type terminals which are designed to carry large currents. Voltage characteristic is completely flat. They differ somewhat in that the 20 HR-15 was designed for a one to ten hour discharge, with discharge rates of 2 to 15 amperes, while the 20 HR-GS and 20 HR-BS were intended for a discharge of approximately six minutes, at discharge rates up to 150 amperes. Overall height is 4 inches, width 2 inches, depth 1¾ inches, weight approximately 12 ounces. They are spillproof and leakproof. They will not boil at high altitudes, will perform at extreme temperatures, can be used in either series or parallel operation.

Yardney Electric Corp., 105 Chambers St., New York 7, N. Y.

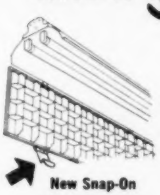
Control Unit (32)

Cat. 120 electronic differential pressure indicating control unit is an electronic control system, consisting of a sensing element and an indicating control unit, designed to indicate and control the differential pressure between a volume of corrosive gas and a surrounding gas. The sensing ele-

METALCRAFT'S NEW **SAMSON**

INDUSTRIAL UNIT IS NOW AVAILABLE

WITH A **Shielding Assembly!**



New Snap-On Hinge Operates with Finger-Tip Pressure!

Yes . . . something new has been added to this versatile fixture . . . a removable shielding assembly that's as tough as the SAMSON itself. The shielding stays permanently in alignment because the louver-blades are locked in a double channel frame. Quick for relamping and easy to clean, too, thanks to METALCRAFT'S new snap-on hinges.

In fluorescent or slimline, with 2-lamp conventional or 2-or-3-lamp turret sockets. Porcelain enamel or baked enamel finish, white inside and gray outside, or all white. Instant start type also available. Quarter-turn "Shakeproof" wing nuts for easy installation and removal of reflector. **WRITE FOR NEW BULLETIN No. SN-1051.**

the Metal-craft *line*

METALCRAFT PRODUCTS CO., INC. • Manufacturers of Fluorescent and Slimline Luminaires • **Mascher & Lippincott Sts., Phila. 33, Pa.**

The accent's on more sales...with AMPLEX SWIVELITES

At the SEARS ROEBUCK STORE in Atlanta, Ga., the recent installation of Amplex Swivelites assures *flexible* accent lighting today and for years to come.

IT'S TRUE in stores everywhere... when you highlight merchandise you boost sales! And it's just as true that in accent lighting there's nothing like Amplex Swivelites for efficiency and economy. The last word in modern design, Swivelites are made of aluminum with a permanent satin finish. Their double-ball swivel permits instant, positive positioning. Ventilated hoods give longer bulb life. And all the basic units of Amplex Swivelites are interchangeable with each other... arranging new lighting effects is quick, easy and inexpensive.

Get the whole story about Amplex Swivelites right now. Just write Amplex Corporation, Dept. C-11, 111 Water St., Brooklyn 1, N. Y.

AND HERE'S SOME MORE OF THE AMPLEX LINE

Colorbeam Reflector Lamps

Outdoor Weatherproof Lamps

"Hi-Hat" Recessed Fixtures

Reflector Spots and Floods

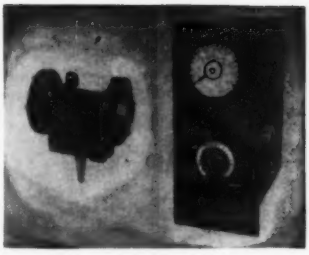
Hi-Bay Reflector Lamps

Street Lighting and Traffic Signal Lamps

Industrial Infra-Red Lamps

AMPLEX

Sealed-Beam Reflector Lamps, Colorbeam Lamps, Spotlites and Floodlites, Industrial Infra-Red Heat Lamps, Vibration and Rough Service Lamps, Street Lighting Lamps, Traffic Signal Lamps, Incandescent Lamps, Fluorescent Tubes, Display Accessories.



ment will note a signal according to the variation in the differential pressure which will produce a visual indication on the indicating control unit located at a distance of approximately 100 to 250 feet from the element.

Henry G. Dietz Company, 12-16 Astoria Blvd., Long Island City 2. N. Y.

Stator Compound (33)

No. 629-A red stator compound is a heavy, putty-like material designed for application to exposed ends of motor stator windings. Provides resistance against oil, moisture, abrasives, corrosive chemicals. For application when stator is first put through the usual insulating varnish impregnation cycle, while stator is still hot or after cooling. Also available in black, No. 629B.

George C. Borthig Co., Inc., P. O. Box 115, East Rutherford, N. J.

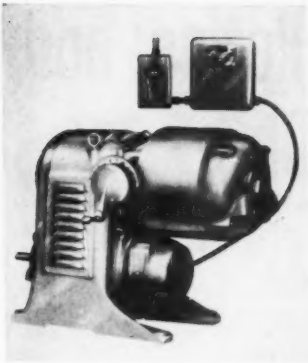
Glass Cloth (34)

Silicone rubber treated glass cloth for motor and cable insulation is in production. In the dipping process that is used, glass cloth is passed through a liquid solution of silicone rubber. After the application of heat to cure the rubber, the treated fabric is ready for use. The process is continuous. Available in 36 inch widths from four to ten mils in thickness.

General Electric Company, Pittsfield, Mass.

Motors (35)

Controlled braking of Varidrive motors is now possible through a new development. The brake used, a Warner type ICB, is mounted directly on the variable speed shaft, eliminating transmission of braking action through belt. Ideal for inching or jogging, the ICB offers instant, shockless operation without noise and produces a constantly increasing torque during stopping. Brake is dc actuated with low



power requirements—maximum 25-35 watts. Power conversion units are used where ac voltage is supplied.

U. S. Electrical Motors, Inc., 200 E. Slauson Ave., Los Angeles 54, Calif.

Product Briefs

(36) Portable Electric Tools, Inc., 320 West 83d St., Chicago 20, Ill., has announced their line of PET superduty portable **electric drills**. . . . (37) The Semi-insulated **electrode holder**, the latest of the Caddy arc welding accessory line, has been announced by Erico Products, Inc., 2070 East 61st Place, Cleveland 3, Ohio. . . . (38) Lightolier, Inc., 11 East 36th Street, New York City, has introduced a new group of shallow **ceiling fixtures**.

(39) **Fireguard**, a fuse coupling which reduces danger from fires caused by damaged cords, has been announced by F. H. Smith Manufacturing Co., 3037 Carroll Ave., Chicago, Ill. . . . (40) Black & Decker Mfg Co., Towson 4, Md., has brought out a new model of the ½-inch Holgun **drill**. . . . (41) Designed to supply increasing demand for a free-spooling tractor winch with fast line speeds and positive brake action, a new D4 HySpeed **Winch** has been developed by Hyster Company, 2902 N. E. Clackamas St., Portland 8, Ore.

(42) The redesign of two Calrod **immersion heaters**, for nickel and copper plating baths and for mild sulphuric acid and chrome plating baths, has been announced by General Electric Company, Schenectady 5, N. Y. . . . (43) Industrial Engineering Equipment Co, 122 E. 4th St., Davenport, Iowa, has introduced a new Wagner Universal **dynamic balancer** which provides a simple method of putting armatures, rotors, pulleys, flywheels, gears, hubs, drums, etc. in true dynamic balance. . . . (44) The John Hewson Company, 106 Water Street, New York 5, N. Y. has announced a new high voltage dc **insulation test unit** with a wide range.

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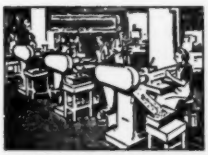
P&S-DESPARD SWITCH & OUTLET COMBINATION

With the modern, interchangeable P&S-Despard line, two or three devices can be assembled under a smart-appearing single gang plate—right on the job. It's simple—practical—to wire the P&S-Despard way.

● P&S Wiring Devices are designed and manufactured to unusually high standards for dependability, performance and ease of wiring. They meet or exceed the minimum safety standards of existing testing agencies.



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Catalogs, Bulletins and Engineering Data

(45) FLUORESCENT LIGHTING operation on 480Y/277-volt distribution system in office buildings is the subject of booklet #16-571-A, describing the use of low-voltage remote-controlled relay switching, and discussing the advantages of the application. General Electric Co., Bridgeport 2, Conn.

(46) DOOR OPERATORS for electric and radio control of residential, industrial and commercial doors and gates, and many types of overhead doors are illustrated and described in 16-page catalog No. 1406-11, including application and installation data. Barber-Colman Co., Rockford, Ill.

(47) SERIES SEQUENCE 430 ma ballast for the series operation of two 96T12 fluorescent lamps is described in illustrated bulletin 551-11, covering weight, dimensions and wiring diagram. Jefferson Electric Co., Bellwood, Ill.

(48) LIGHTING GUIDE offers 64-pages of engineering information on the description, performance, application and installation of 270 lighting units, including lighting design data, lighting controls, candlepower distribution curves and calculation methods. Holophane Co., Inc., 342 Madison Ave., New York 17, N. Y.

(49) RADIANT HEATING catalog No. EL-16 presents application and installation data and specifications on glass baseboard heating panels, wall panels and controls for the panels. Appleman Glass Works, Bergenfield, N. J.

(50) ELECTRIC PLANTS, air cooled and full diesel powered, 3,000-watt, 115-, 230- or 115/230-volt ac and 32-40 volt dc, are illustrated and described with operating details in Form A286. D. W. Onan & Sons Inc., Minneapolis 14, Minn.

(51) LUMINOUS CEILINGS are sketched and explained with performance data in 4-page bulletin, including construction and illumination characteristics, application, installation and maintenance information. Luminous Ceilings Inc., Suite 954, 135 S. LaSalle St., Chicago, Ill.

(52) THERMOSTATIC CONTROL designed for radiant glass heating systems is the subject of 4-page bulletin describing construction and operation, and including installation details and wiring diagrams. Continental Radiant Glass Heating Corp., 1 East 35th St., New York 16, N. Y.

(53) BALLASTING fluorescent lamps is discussed in 20-page booklet GEA-5731 and 4-page bulletin GEA-5672, covering fundamental theory of ballasting, operation of fluorescent lamp, circuits involved and an illustrated description of the system of ballast selection by sound rating. General Electric Co., Schenectady 5, N. Y.

(54) MOTORS, Type F, high-slip, high-torque, for punching, forming and shearing machines, are described and illustrated in bulletin #F-2, including performance characteristics and application data. Howell Electric Motors Co., Howell, Mich.

(55) LIGHTING FIXTURES for commercial, industrial, residential and display purposes, with recommended uses and specifications, are listed with illustrations and distribution curves in 35-page catalog No. 52. Apollo Lighting Fixture Co., Inc., S. Fourth Ave., Mount Vernon, N. Y.

(56) SIGNALING DEVICES, including bells, buzzers, chimes, signaling transformers and push buttons, fluorescent ballasts and electrical specialties are described and illustrated in 8-page catalog. Lee Electric Co., 132 Beckwith Ave., Paterson, N. J.

(57) CONTROL THERMOSTAT for radiant and convector heating systems, or for operation of motorized valves or fans in warm air radiant systems, is the subject of 4-page supplement No. 2. Sarcotherm Controls, Inc., Empire State Bldg., New York 1, N. Y.

(58) TANTALYTIC CAPACITORS for low-voltage dc applications requiring small size, light weight and long operating- and shelf-life, are discussed in bulletin GEC-808. General Electric Co., Schenectady 5, N. Y.

(59) FUSION WELDING of nickel and high nickel alloys, electric arc and gas welding, is the subject of 44-page technical bulletin T-2. The International Nickel Co., Inc., 67 Wall St., New York 5, N. Y.

THE NEW

Polyken®

INDUSTRIAL TAPES

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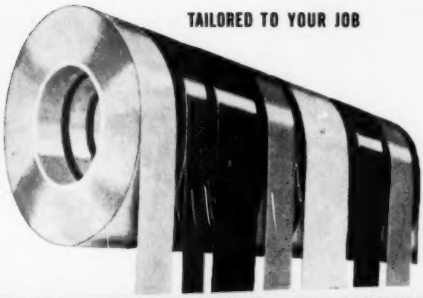

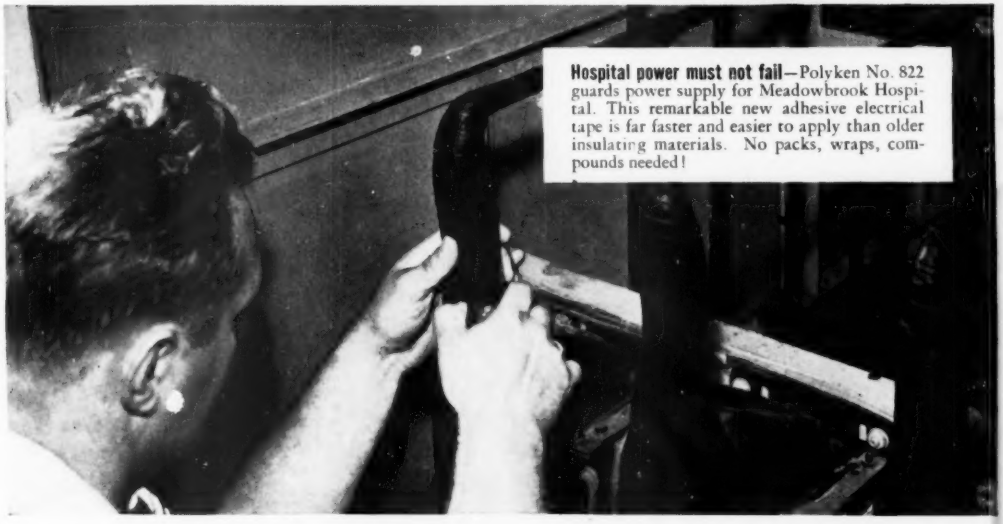

Hospital power must not fail—Polyken No. 822 guards power supply for Meadowbrook Hospital. This remarkable new adhesive electrical tape is far faster and easier to apply than older insulating materials. No packs, wraps, compounds needed!

New tape applied in half the time controls high voltage

The new Polyken Tape No. 822 wraps high-voltage installations in *half the time* required by old methods.

This means convenience, speed, and an obvious savings in labor.

Take, for example, Meadowbrook Hospital, Nassau County, N. Y. They formerly used varnished cambric, but have now cut insulating time by 52% using this inexpensive corona-quenching tape for cable and bus bar insulation of their double-end power center.

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Polyken, Dept. ECL, 222 West Adams St., Chicago 6, Ill.
For specifications, samples, and further information on this and other Polyken tapes, please send me your *FREE BOOKLET*, "Tape is a Tool."

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THE New
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Another pioneering step in industrial lighting, designed to give maximum illumination with a minimum of glare at lowest maintenance cost. The new ABolite GBF Protecto-Reflector protects the lamp against water damage and dirt fogging, and reflects the greatest possible light.
The GBF Protecto-Reflector is the first reflector of this type ever produced! The complete line of ABolite lighting equipment includes industrial, commercial, floodlighting installations. Specify ABolite . . . first and finest in the incandescent lighting field.
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THE JONES METAL PRODUCTS CO., West Lafayette, O.
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ABOLITE Lighting

(60) MATERIALS HANDLING is the subject of a 24-page booklet which evaluates present methods of handling and presents an analysis of cost-cutting methods of materials handling, with charted data on making a time and motion study of handling. The Yale & Towne Mfg. Co., 11000 Roosevelt Blvd., Philadelphia 15, Pa.

(61) CABLE CONNECTIONS for electric welding, including electrode holders, ground clamps, cable splicers, terminal connectors and cable lugs, are described and illustrated in 12-page catalog. Tweco Products Co., P. O. Box 666, Wichita 1, Kansas.

(62) LOUVER UNITS for silvered bowl or semi-silvered bowl lamps are illustrated with construction and application data in 4-page bulletin. Litecraft Mfg. Corp., Brooklyn 11, N. Y.

(63) CLAMPS AND STRAPS for conduit, pipe and cable, masonry drills, ram anchors, expansion bolts, screw anchors, toggle bolts, hook bolts and pole line hardware are priced in 12-page catalog No. 51. Diamond Expansion Bolt Co., Inc., Garwood, N. J.

(64) TOTALLY-ENCLOSED MOTORS with air-to-water heat exchangers and practical applications in large ratings of horizontal and vertical induction and synchronous types are discussed in bulletin 05B7682. Allis-Chalmers Mfg. Co., Milwaukee 1, Wis.

(65) MOTOR CONTROLS are specified and priced in 88-page illustrated book describing ac and dc motor starters, motor control centers, contactors, relays and accessories, including application information and construction data. The Clark Controller Co., 1146 East 152nd St., Cleveland 10, Ohio.

(66) SYNCHRONOUS MOTORS of the pedestal-bearing, coupled-type for direct coupled drives with varying torque requirements, and in ratings of 100 hp and larger are described with construction and performance characteristics in bulletin 05B7648. Allis-Chalmers Mfg. Co., Milwaukee 1, Wis.

(67) ELECTRIC HEATERS for industrial use, including immersion heaters, melting pots and circulation heaters, are illustrated in folder. Edward L. Wiegand Co., 7500 Thomas Blvd., Pittsburgh 8, Pa.

(68) INSULATION TESTER for testing dc armatures, series field coils and low impedance ac stator coils is explained and illustrated in bulletin GEC-794, including operation details. General Electric Co., Schenectady, N. Y.

(69) Oil Switches, type RA load break, 400 ampere, rated 600, 7,500, 15,000 and 23,000 volts, are subject of bulletin DB51. G & W Electric Specialty Co., 7780 Dante, Chicago 19, Ill.

(70) Industrial Tape catalog consists of cardboard folder containing five file cards with sample strips of the various tapes, along with technical specifications and general information on uses. Polyken Industrial Tape, 222 W. Adams St., Chicago 6, Ill.

(71) Capacitors, fixed paper-dielectric, for ac and dc applications are described and illustrated in 16-page booklet. General Electric Co., Schenectady 5, N. Y.

(72) Flexible Conduit with tough extruded synthetic covering over flexible metal core, for use in permanent and temporary installations requiring liquid-tight conduit, is the subject of 4-page illustrated bulletin No. C-201. American Metal Hose Branch, The American Brass Co., Waterbury 20, Conn.

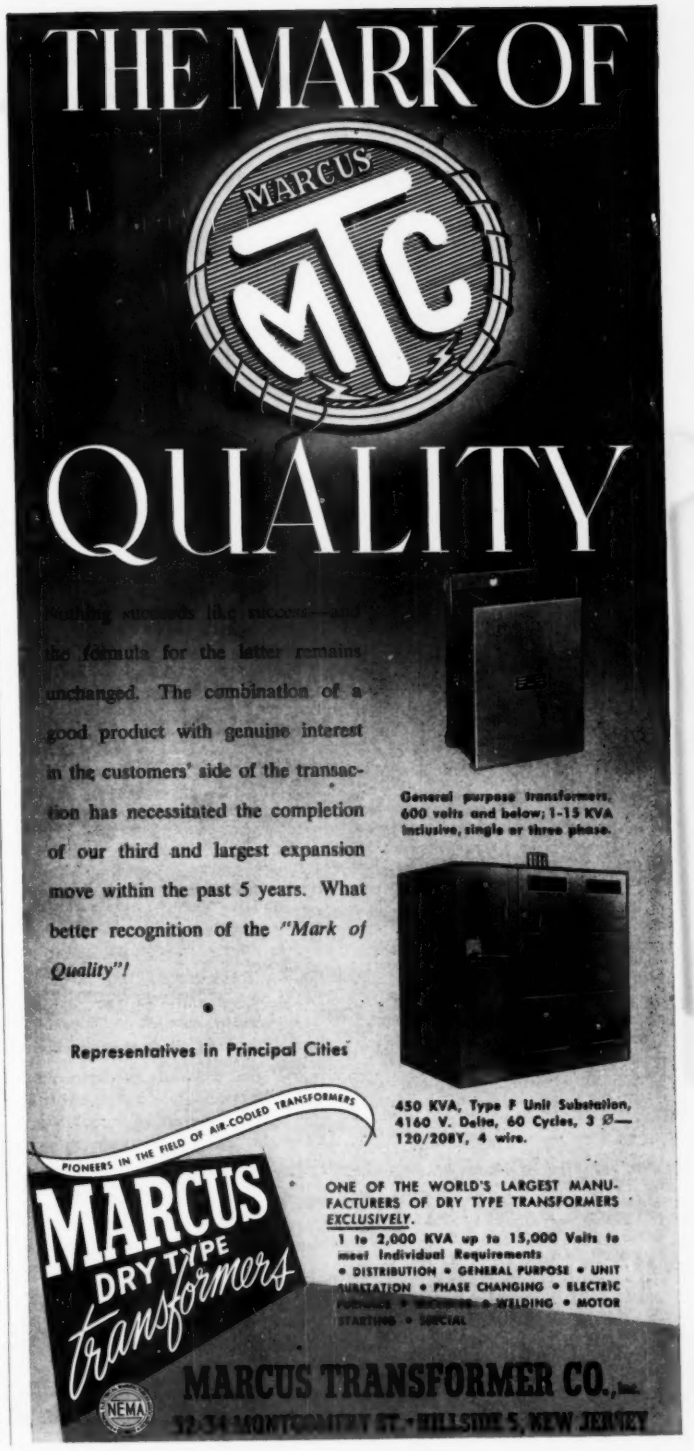
(73) Microhm Meter for checking circuit breaker contacts without disassembling breaker, and for detecting abnormally high resistance in cable joints, bus bar connections and windings, is illustrated and described in 4-page bulletin 3051. J. W. Dice Co., Engle St., Englewood, N. J.

(74) Screen Booth Filter for removing the high-level interference on power distribution circuits, allowing operation of sensitive test instruments in shielded test rooms, is the subject of 13-page illustrated catalog No. 201. Tobe Deutschmann Corp., Norwood, Mass.

(75) Selenium Rectifier power conversion units, 0.75 to 25.0 kw, 125 and 250 volt dc ratings, are discussed in two-color 8-page booklet. General Electric Co., Schenectady 5, N. Y.

(76) Pressure Fittings, solderless, including connectors, lugs, taps and bus bar fittings, are listed and illustrated in 56-page bulletin No. 66, with full page drawings explaining use of each type. The Thomas & Betts Co., Inc., 34 Butler St., Elizabeth, N. J.

(77) Research Bulletin No. 46, entitled "An Investigation of Large Electric Motors and Generators of the Explosion-proof Type for Hazardous Locations, Class I, Group D", is a 45-page report on construction characteristics in relation to explosion hazards. Underwriters' Laboratories, Inc., 207 E. Ohio St., Chicago 11, Ill.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unchanged. The combination of a good product with genuine interest in the customers' side of the transaction has necessitated the completion of our third and largest expansion move within the past 5 years. What better recognition of the "Mark of Quality"!
Representatives in Principal Cities
General purpose transformers, 600 volts and below; 1-15 KVA inclusive, single or three phase.
450 KVA, Type F Unit Substation, 4160 V. Delta, 60 Cycles, 3 Ø— 120/208Y, 4 wire.
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ONE OF THE WORLD'S LARGEST MANUFACTURERS OF DRY TYPE TRANSFORMERS EXCLUSIVELY.
1 to 2,000 KVA up to 15,000 Volts to meet Individual Requirements
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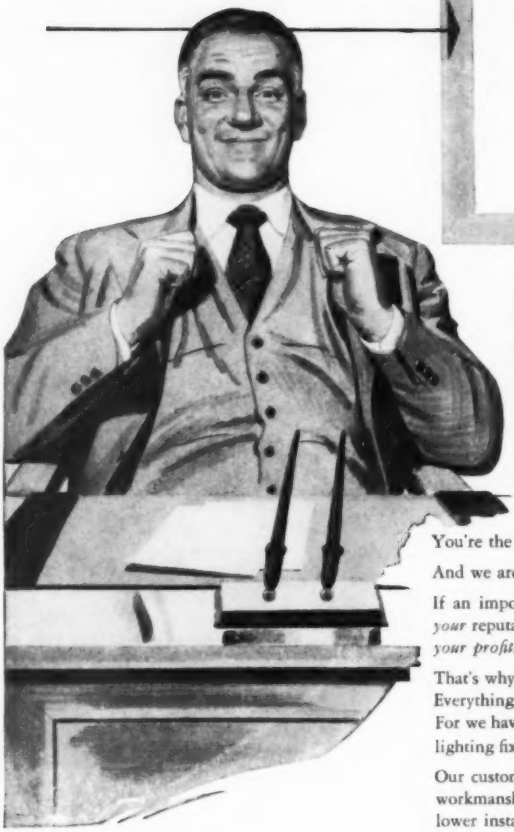


FROM "THE BUSINESS OF ELECTRICAL CONTRACTING"

A Report by Robert W. McChesney, Chairman of the Research and Education Committee, National Electrical Contractors Association.

"The electrical contractor occupies a position of great trust and responsibility, a position which compares favorably to that occupied by bankers, doctors and other professional men. In an age of specialization, the electrical contractor is a specialist having the know-how, the experience, the training, the organization, and the equipment to provide for the needs of our great nation in its utilization of electricity."

DAY-BRITE AGREES . . . Our Goal, like the NECA's, is to Help You Protect and Build "Professional Standing" for Yourself and the Industry.

You're the "doctor". . . the specialist.

And we are one of the groups of people who fill your prescriptions.

If an important ingredient is left out—if inferior ingredients are used—*your* reputation, *your* standing in the community and, in the long run, *your profits* will suffer.

That's why Day-Brite fixtures are quality-built all the way through. Everything is the best—*has* to be the best—even if it costs more. For we have found that *quality pays*. Day-Brite, today, sells more lighting fixtures than any other one company in the business.

Our customers have discovered that quality materials, quality workmanship, quality design give them "bonuses" in the form of lower installation costs, lower maintenance costs, longer life which more than make up for any difference in price.

We know that this same policy—selling quality, really selling quality, always selling quality—will pay off for you. Far more handsomely than cutting prices, cutting profits, cutting your own throat on straight "bid" business!
Day-Brite Lighting, Inc., 5402 Bulwer Ave., St. Louis, Mo.

NOW, MORE THAN EVER...

AMERICA MUST *SEE* WHAT IT'S DOING

IT'S EASY TO SEE WHEN IT'S

"DECIDEDLY BETTER"
DAY-BRITE
Lighting Fixtures

119

QUESTIONS from readers on problems of industrial equipment, installation, maintenance and repair. Answered by electrical maintenance engineers and industrial electrical contractors out of their experience. For every question and every answer published we pay $5.00.

Reader's Quiz

Rural Distribution

QUESTION V18—*A rural distribution line of 6600 volts, with one side grounded to earth, at every fifth pole, has a heavy "surge" current when first energized.*

It is supplied by 50 amp fuses, and they will blow when energized, unless the men go some distance below and disconnect some of the "spur" lines first.

The load is not heavy, and evidently no trouble on it. There are probably 110 customers supplied by the 50 amp fuses.

Is it possible there can be enough "capacity" to do this with the grounded system, when the load is all connected at once? The earth is acting as one plate of a condenser, and it is hilly country with considerable ledge and mineral.—M.C.T.

ANSWER TO V18—The trouble M.C.T. speaks of may be due to any one of the conditions listed below or to a combination of them all.

First. If the circuit covers a large area considerable charging current will flow due to condenser action. This, in a long transmission line, may cause the breaker to open on overcurrent but I would hardly expect it to do so on a rural 6600 volt line.

Second. If energized when a large number of lamps are on the inrush will be several times the normal current of the lamps due to the low resistance of the tungsten filaments which have a very low resistance when cold.

Third. A rural district has a large number of small machines which start automatically such as deep well pumps for the water system, refrigerators, furnaces. If the current has been off for sometime, these will be waiting to start as soon as it comes on. They are all comparatively small motors but they take from four to six times normal full load current when starting. That is the first inrush of current which is only momentary but is of sufficient time to blow a fuse or open a circuit breaker.

I think your trouble is due to a combination of the above three rather than any one of them. If your trouble was entirely due to capacity, reactors could be installed. This would be expensive and should not be done unless recommended by the manufacturer, after tests had been made. If you can train your customers to turn off their lights and automatic machines when the power fails I think it would help, but this would be a difficult job.—A.E.T.

Refrigeration Installation

QUESTION W18—*Recently, we were called to service a medium sized refrigeration installation. After completing our necessary repairs, as a matter of course, we made an ammeter check of the 3 phase, 220 volt, 3 hp motor. The current in two of the phases was 8.9 amps, but in the third phase only 4 amps were being drawn. An immediate voltage check was made between the phases, and all potentials were equal within a very small percentage, which led us to believe that a defect existed within the motor. Before opening the motor for tests, we checked a second, similar installation, fed from the same feeders and found exactly the same conditions. We then checked four or five other 3 phase motors of various sizes and found in every instance two phases drawing normal current and the third approximately half normal. In no case was there any sign of overloading or heating, and all motors started easily with full torque produced.*

Is there some fault which could exist in the supply system which could cause this condition, and how can this be checked and cured, or does it cause no harm?—G.L.R.

ANSWER TO W18—From all indications, it appears that the trouble lies in too many induction motors on your three phase 220 volt circuit. This would not indicate an overload on that circuit but rather indicate too much of an inductive load which in turn affects the power factor of the circuit. Assuming the supply transformer to be connected properly and in good shape, the circuit can be corrected to a higher power factor by the addition of capacitors or synchronous motors to your existing installations. Low power factor does not apparently do any damage to your equipment but if you are interested in your pocketbook, it might be better to correct this condition.—L.C.D.

ANSWER TO W18—Sounds like the motors are connected to an open delta transformer or to an unbalanced 3 phase system. Both result in a slightly lower voltage between 2 phase wires. This can cause unbalanced current in a motor. An unbalanced motor winding can result in the same trouble. An underloaded motor is not harmed by this. If an ammeter is used near a magnetic field, you can also get a wrong reading.—H.S.

Testing Starters

QUESTION X18—*Which is the best way to test fluorescent starters FS-2 and FS-4? I am also interested in knowing how others can be tested.—F.D.*

ANSWER TO X18—I seem to recall seeing a tester made by Sylvania for the express purpose of testing fluorescent equipment, starters included.

Or I might suggest hooking up a lamp and making the starter socket easily accessible. This would, of course, require separate units for each size of starter.

I might also suggest determining the voltage and wattage of the filaments in the ends of the tubes, and obtaining a filament-type lamp of equal rating. Hook up a proper size ballast, wire the lamp as you would normally wire the filaments of the tube, and wire a voltmeter across the starter terminal. The voltmeter should read zero or close to it for two or three seconds, then jump to near line voltage and stay there, if the starter is normal.—E.A.

ANSWER TO X18—Having the proper bulb for a load is the surest method of testing any fluorescent starter and is, I believe, ahead of any instrument tests that can be made.

Remove a starter which is operating a bulb all right, insert the starter that you wish to test.

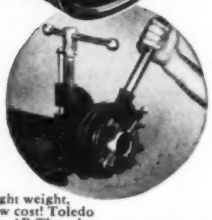
On a fixture with two or more bulbs, as long as one bulb is operating, you can test the other starters easily.

There are, available, regular fluores-

THREAD PIPE *Faster*
BY HAND OR MACHINE
Cut Costs with **TOLEDO**

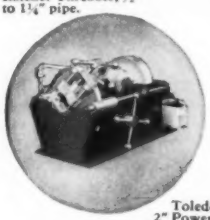
Good tools help you speed up pipe fitting and beat high costs!

Start the job *right* with genuine TOLEDO Pipe Tools and Power Pipe Machines—tools you can trust for top-performance and top-speed production! Each Toledo designed for *easy handling, faster cutting* . . . in a complete range of capacities. Hand Tools, all pipe sizes, ⅛″ to 12″ and ¼″ to 1″ bolts. Power pipe machines, up to 2″ and 4″ capacity. Your mechanics will do better work, faster and easier with time-proven Toledos —the choice of experienced hands for nearly half-a-century. Write for catalog. The Toledo Pipe Threading Machine Co., Toledo, Ohio. New York Office: 165 Broadway, Room 1310.



Light weight, low cost! Toledo No. 1R Threader, 1″ to 2″ pipe.

For close corner work, Toledo No. 11 Ratchet Threader, ½″ to 1¼″ pipe.



Toledo No. 999 2″ Power Pipe Machine, wheel or knife cut-off.

RELY ON THE LEADER

TOLEDO

PIPE TOOLS . . . POWER PIPE MACHINES . . . POWER DRIVES

cent testing units, but most of them employ the same principle of testing a starter with a bulb of corresponding size.—M. C. T.

ANSWER TO X18—The best way to test starters is by supplying a 15% overvoltage and a 15% undervoltage to a fluorescent fixture using the starter.

This system will locate shorted starters, flickering starters at low and high voltage, and slow starters. It will not locate bad starter condensers or bad ballasts.—H. S.

Exciter

QUESTION Y18—*We have a 250 volt 200 ampere shunt wound direct connected exciter that runs at 3600 rpm. Recently, we were alarmed when the machine began to spark violently on two brushholder arms of like polarity. It was found that the sparking could be stopped by tipping any one brush of the two sets slightly in its holder. As suddenly as it started, the sparking ceased. Could anyone suggest a reason for this sparking?* —W.P.R.

ANSWER TO Y18—After several changes of brushes and readjustment of spring pressures and positions, I found that a slight advancement of the brushholder (say 1/32 inch) in the direction of rotation solved my problem. When the new brushes were replaced, which were recommended by the manufacturer of the generator, they were well fitted within the brushholders.

Since they were installed and the new neutral plane found, I have had no trouble in two years.—O.C.

ANSWER TO Y18—The apparent reason for sparking was the wearing of the brush so that its tilting in the holder made contact with the commutator of a "point" type rather than a spanning of the gap or spare of two or more bars as contemplated by the designer.

The correction is possible by careful sandpapering of the brushes to allow close fit to the commutator surface.—C.O.D.

Paging System

QUESTION Z18—*We have an auto call system (paging with lighting code) which consists of many thousands of feet of wire feeding eight different*

buildings spaced about 2000 feet apart, roughly, which is fed by impulses (motor driven selector switch sends the proper number of impulses) from a 110 volt ac system with bare neutral. These pulses which are sent to the various buildings operate relay mercury switches which in turn operate the paging lamp within the building, picking up the voltages for the lamps from a circuit within the building. These pulses, which are sent out from a central building, travel underground and overhead on poles; and when a ground takes place on the hot leg of the impulse feeder, it becomes rather hard to find as we always have the normally grounded neutral, to which the relay coils are connected, to contend with. The feeders are No. 6 AWG wire size.

Could someone suggest a good method of localizing a ground on this system because a ground on the hot leg (does not have to be a solid ground) will prevent the pulses from operating the relay coils. There are nine relay coils connected to this wiring with about 45 ohms per coil. Coils are connected from one side of line to bare neutral wire.—B.J.K.

ANSWER TO Z18—One way to determine which circuit the ground is on is to take a clipon ammeter and take a current reading on each individual circuit between buildings. The ammeter would register the pulses as the autocall sent them out and the circuit which had the highest ammeter reading would almost invariably be the grounded circuit. You could use the clipon ammeter to determine the part of the circuit that was grounded for when you reached a point in the circuit that the ammeter did not register current or only a weak current then you would have passed the ground.

If a single conductor did not give a large enough reading on the ammeter then you could loop two or more turns of the conductor inside the clip of the ammeter to increase the reading to a suitable point.—L.O.W.

ANSWER TO Z18—It immediately appears that some improvement could be achieved initially by maintaining the circuit "above ground" by eliminating the grounded neutral feature. After many years of experience with all types of communication circuits in wet mines and tunnels I find that the work of keeping lines free of leaks is reduced by one-half if use is made of either batteries or an insulating transformer having a one-to-one ratio. The transformer can be coupled as to primary to either a 115 volt supply, or the two hot legs of the conventional 230-115 volt service. It, of course, depends on the voltage.

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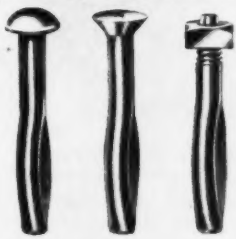

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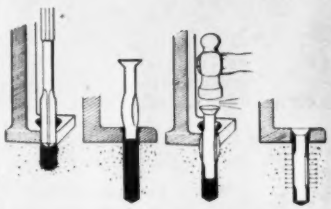

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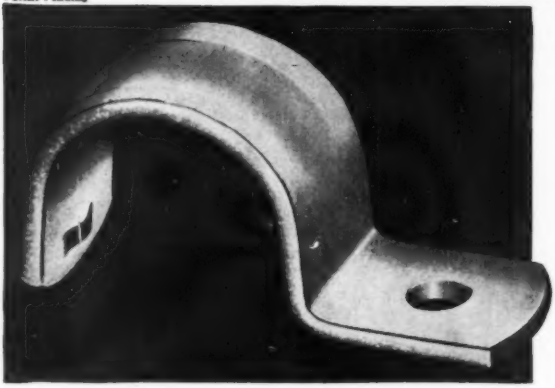

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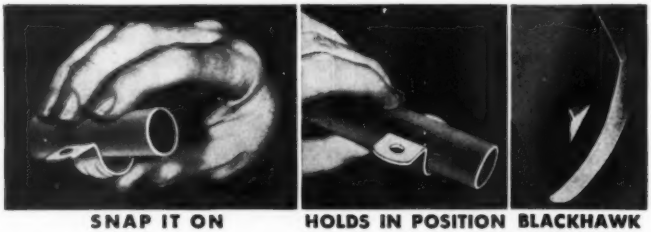

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With the signal circuit of Z18 free of ground it is quite a simple trick to install a series of ground detectors that warn him in due time of encroaching trouble as dampness creeps into his underground runs, or insulation slowly weathers on the aerial runs.

There is also the technique universally employed by telephone firms where from time to time the outgoing lines are placed on the test panel and analyzed during idle night hours. By that method troubles are detected early, long before the subscriber has an inkling that his service was impaired. In telephone service the cable department makes excellent use of the Wheatstone bridge to trace shorts and grounds to a neat span's length where the trouble man can isolate the trouble in short order by opening up bridging "jumpers" in any one of many aerial or manhole boxes.

There is, perhaps, no more exacting a job for the wire man than that of maintaining a power supply to mine and construction blasting operations using electrical ignition for the detonators. The use of grounded circuits is definitely ruled out for that serviceman if but a minimum of current bleeds off to earth, portions of the charge will fail to detonate. The shot does not break the desired yardage of rock, and what is even more hazardous —much unexploded dynamite is encountered in the muck pile by the shovelers. The motto is: Keep vital circuits free of ground for easy analyzing of troubles and speedy corrective action.—P.C.Z.

Can you ANSWER these QUESTIONS?

QUESTION Q19—What, if any, are the advantages of completely self protecting transformers for industrial distribution systems? Our plant primary lines are 2300 volt overhead construction on wooden poles, with substations located near the load centers. Currently we use Type S transformers, with separate lightning arresters, and fused cutouts on the substation structure. Would CSP transformers serve us better?—D. H. N.

QUESTION R19—On our job we have a General Electric Electrostatic Ground Detector. It is connected on a 3 phase 600 volt bus., but the instrument has no ground connection.

The meter has 3 separate dials and each has its own needle and scale. Can anyone explain how this detector works without a connection to ground? —H.J.B.

QUESTION S19—At present I am maintaining numerous dc motors, compound series and straight series type motors. The magnetic contactor panels and remote control boards are of early type. I would like to have a practical diagram of these circuits and method of operation. I have been used to ac motor control. These boards have a set of contactors on the top and a set of contactors on the bottom with blade switches in the center. The voltage is 250 volts, 2 wire system.—L. R. L.

QUESTION T19—I have a Century motor, wound as a four pole, split phase motor, except that both windings are identical as to size of copper and also number of turns. This motor has no centrifugal switch for starting. What size of capacitor is necessary for the starting winding, and also for the running winding?—E. S. H.

QUESTION U19—What is an easy way of removing the excess solder from fluorescent bulb tips? This excess solder breaks the sockets.—H. S.

QUESTION V19—Could some one give circuit details of an economical way in which I can maintain constant a 110 volt ac supply within plus or minus two volts across a load which takes about 20 amperes? The voltage supply that I am to use varies from about 108 volts to about a high of 120 volts over a 24 hour period and I would l'ke to keep it constant at a value of 110 volts across my load.—E. J. K.

QUESTION W19—It has been my experience that some fluorescent lamps can cause excessive radio interference even though the lamp appears to be operating normally. If this is due to the lamp itself, what is causing the trouble?—P. S.

QUESTION X19 — Could someone give me the required design data, to design an ac reactor, for starting a 100 hp, type CCL, Westinghouse squirrel cage induction motor, 220 volts, 215 amps, 580 rpm? The starting load requires about 85% of the line voltage. —L. H. M.

QUESTION Y19—What circuit would I have to use to get a portable 100 watt lamp for a 25 cycle 120 volt circuit so that the light will not flicker?—H. S.

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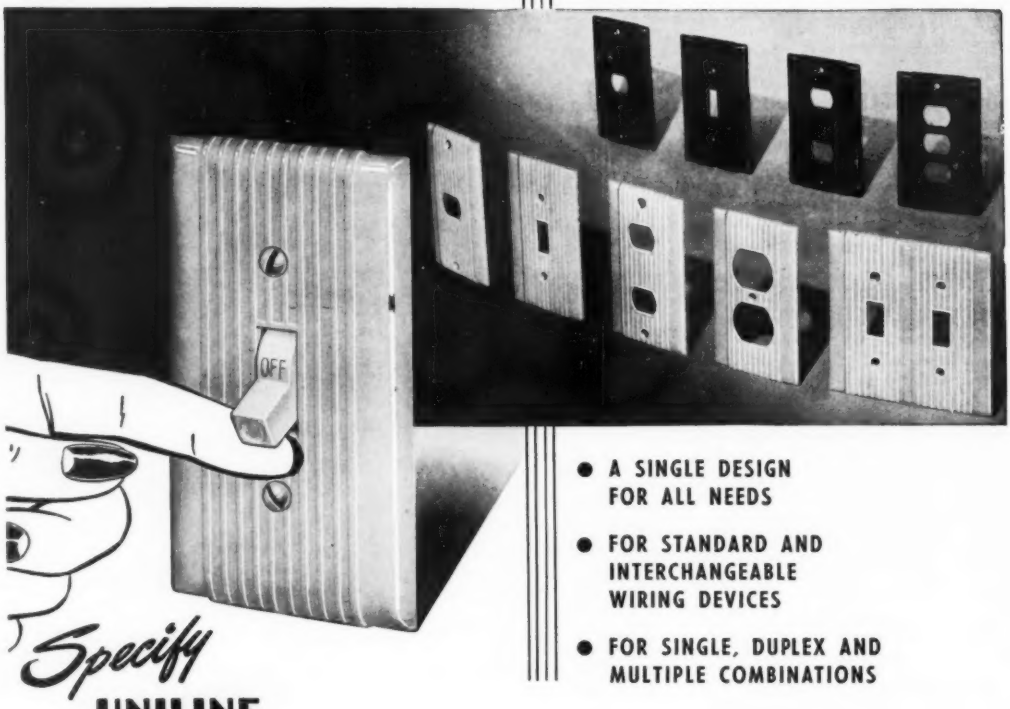

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New York, N. Y.

and

Answered by
GLENN ROWELL
Electrical Engineer
Fire Underwriters Inspection Bureau
Minneapolis, Minn.

and

B. A. McDONALD
Chief Inspector
New York Board of Fire Underwriters
Rochester, N.Y.

Questions on the Code

Emergency Lighting In Factory Building

Q. *We have a factory office building with no emergency lighting provided. Exit lights (110 volt ac) are placed over each outside door. Should the exit light wiring all be placed in a separate conduit and connected ahead of the main breaker? Or may exit lights and general lighting wiring be combined in a single conduit?*—A.H.S.

A. Insofar as the N. E. Code is concerned, it appears that none of the provisions for emergency lighting or exit lights as covered by Article 700 would apply to your factory building unless one of the two following conditions existed:

1.—Some part of the factory building is designed, intended or used for dramatic, operatic, motion picture or other shows, where the seating capacity exceeds 100 persons. This provision is covered by Section 5201 of the N. E. Code.

2.—The Municipality, State or other Codes require emergency lighting for factory occupancies in the area in which your factory is located. See N. E. Code Section 7001.

If either one of these provisions do not apply to your factory, none of the rules of the N. E. Code under Article 700 covering emergency lighting apply. If your State Labor Laws or your Municipal Building Code or any other Code requires exit and emergency lighting, it should then be installed in accord with the Article 700 of the N. E. Code.

Irrespective of the foregoing, however, Section 7001 of the N. E. Code refers us to the National Fire Protection Association Building Exits Code. While the provisions of this Building Code are not mandatory or officially recognized as National Electrical Code requirements, it is considered good practice and engineering that such a standard be fully recognized and satisfied. I would suggest that you obtain a copy of this standard and apply the provisions pertinent to your factory.

Assuming that your factory comes under the requirements of the N. E. Code, I would answer the definite questions you have asked as follows:

Under Article 700, Emergency Lighting, the Code does not require exit lights to be run in separate conduits, provided the provisions of Section 7021 are satisfied. According to Section 7003, the exit lights are a part of the emergency lighting, and the general requirements for emergency lights likewise apply to exit lights. According to Section 7021-b of the Code, emergency lighting and general lighting may be run in the same conduits, boxes, fixtures etc., provided you have two or more separate and complete systems with independent current supply, each providing emergency lighting. If you do not have separate and complete systems, the emergency lighting shall be kept entirely independent of all other wiring and equipment as covered by Section 7022 of the Code. —B.A.McD.

Service Equipment

Q. *Is there any ruling in the National Electrical Code which would prohibit the location of the service equipment for a schoolhouse within the stockroom utilized for the storage of school supplies. The service is four wire three phase 230 volt and will be of the fully enclosed type.*—R.F.H.

A. Your question actually is one that can only be answered by the electrical inspector having jurisdiction over the area in which this schoolhouse in question is located as it will depend entirely on the accessibility of this service equipment. Section 2351 simply states that each set of service entrance conductors shall be provided with a readily accessible means of disconnecting all conductors from the source of supply. Inasmuch as the school supply room will of necessity be locked, it becomes a question of the accessibility of the key to this supply room in the event of an emergency; and that can only be determined by an inspector on the premises. In most cases, there would undoubtedly be little question about the location of service equipment in a storage supply room as the term "readily accessible" means readily accessible to the occupants of the building. So unless the keys for this room were kept by someone not present within the building at all times, the room would be accessible to the occupants of the building.—G.R.

Service Disconnect

Q. *Will you kindly explain how a contractor may install a six circuit panelboard in a box for an industrial plant in one building with one set of service feeders and have it accepted without a main service switch* —R.J.M.

A. Section 2351-a of the Code recognizes as a service disconnecting means, six switches or circuit breakers in a common enclosure. The last sentence of this rule also specifies that the disconnecting means shall be of a type approved for service equipment and for prevailing conditions. If the example you describe in your question meets this requirement, there is no Code violation. The important factor is to be sure that the disconnecting means, as a unit, is approved by the Underwriters Laboratories and that each switch is suitable for service use. If you specify accordingly, I am sure you will obtain a service assembly that will be adequate for such use and satisfy all Code requirements.—B.A.McD.

Wiring in a Cold Storage Plant

Q. *A short time ago, one of our local contractors requested permission to install the new corrosion and moisture resistant barn wire in a local cold storage plant in this city; and knowing of the ability of this new conductor to stand up under such conditions, I advised him to go ahead with the installation. Shortly before this job was completed, a competing contractor who apparently figured using some other material complained to me that we were not enforcing the ordinance as written in this city, as the National Electrical Code prohibits definitely the use of nonmetallic sheathed cable for the wiring of such a location. Our ordinance adopts by reference the National Electrical Code, and after reading over Section 3362, I am inclined to agree with this contractor that I was wrong in okaying the use of this new wiring material. I therefore am in desperate need of any help you can furnish which would justify*

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my acceptance of this installation.—M.P.G.

A. While it is true Section 3362 of the National Electrical Code does prohibit the use of nonmetallic sheathed cable in cold storage warehouses, it is also true the only change made in this section since the development of this new moisture resistant and fungi-proof barn wire was the addition of the fine print note following Section 3362, which indicates this new type of barn wire is suitable for use where corrosive fumes, vapors and moisture exist.

During the development of any new wiring materials or techniques, there is bound to be a lag between the development period and the full recognition by national standards. However, most standards, and that includes the National Electrical Code, take care of this situation by stating that the authority enforcing the code in question shall have the final say as to the acceptability of the method or materials used. In the National Electrical Code, under Section 1101, we find the following wording:

"The conductors and equipment required or permitted by this code shall be acceptable only if approved. See definition of "Approved" in Article 100."

And under the definition of "Approved" is the following wording:

"Acceptable to the authority enforcing this code."

Therefore, in my opinion, an electrical inspector is perfectly justified in accepting a new material not fully provided for in the present text of the Code if he is satisfied that this material is suitable for the use intended. In connection with barn wire, possibly an error was made by not classifying this material under Article 340, nonmetallic waterproof wiring. However, at the present time a concerted effort is being expended to bring about a rewriting of Section 3362 to give proper recognition to the new type of cable and it is hoped to subdivide this section so we will in the future provide both for the fibrous jacketed nonmetallic sheathed cable and also for the moisture and corrosion resistant wire.—G.R.

Wiring Wet Locations

Q. *I am designing a lighting system of a stock house of a brewery. These places, as you know, are wet locations. Please advise what precautions must be taken for the tubing wiring, panelboards etc. We have 90% relative humidity. Is it*

necessary to arrange for draining and how?—B.P.

A. I assume from the above question that you intend to use electrical metallic tubing as the wiring method in this brewery, which is a wet location with high humidity. Section 3484 of the N. E. Code recognizes the use of EMT for such a wet location but Section 3488 of the Code advises that the couplings and connectors used must be of a type to prevent water from entering the tubing. Section 312 of the Code advises that where condensation or accumulation of moisture within the raceway is likely to occur that the conductors used must be Type RW, TW, or lead covered.

Section 3015 of the Code advises that where raceways are exposed to different temperatures, provision shall be made to prevent circulation from a warmer to a colder section of the raceway. This may be attained by the use of a sealing fitting installed at a point where the raceway enters the cooler section. Such action will prevent condensation in the raceway and answers your question regards the necessity for draining. It is my opinion based on Code requirements that, if the raceways have sealing fittings as above required and that the proper type of insulated conductors are used and that all fittings and boxes are watertight, you will have no necessity for draining the raceways. In addition to the foregoing Section 3732 requires cabinets and cutout boxes to be weatherproof and if of the surface type to be so designed that water will not accumulate within such enclosures. Section 3804 requires switches or circuit breakers installed in a wet location, to be enclosed in weatherproof enclosures. Section 3852 covers the same requirements for switchboards located in wet locations. Section 4111 requires fixtures installed in wet locations shall be of vaporproof or other types approved for such locations and shall be constructed so that water will not accumulate within the fixture.

I sincerely believe that if you will follow all of the Code requirements for wiring and devices located in wet locations, you will obtain an installation that will give good service—B.A.McD.

Farm Wiring

Q. *We have a new inspector now in the area who insists that where we run conduit up from the animal section through the hayloft of a farm barn to protect the circuit supplying the hayloft lights, this conduit be sealed at the top and left open at the bottom. On the other hand, where we run a conduit through a wall*

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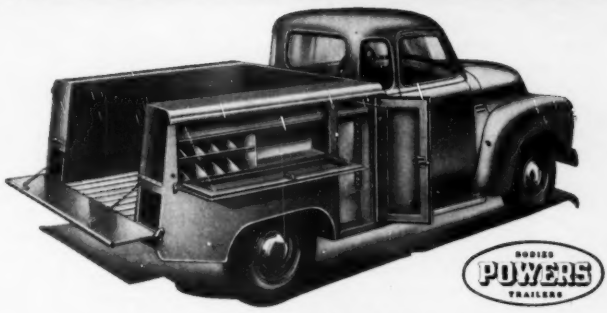

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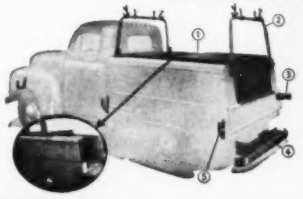

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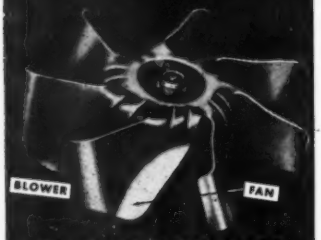

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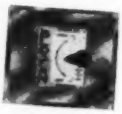

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for protection of the barn wire, he is asking for seals on both ends of the conduit. Is this an idea of his or is it based on the Code?—G.C.R.

A. As you probably know, the National Electrical Code as yet does not contain very many sections specifically aimed at wiring on farm properties, with the result that it is necessary for the various agencies supervising the installation of wiring on farm properties to add to the rulings contained in the National Electrical Code special rulings for the proper safeguarding of these installations. Experience has shown that in climates subject to freezing during winter months it is essential that a conduit extending from a warm to a cold portion of a farm building housing livestock be sealed at its upper end to stop the flow of air through the conduit and the subsequent condensation of moisture within the conduit. In some areas an attempt has been made to seal both ends with the result condensation formed and being unable to drain from the conduit, collected in sufficient amount to actually cause rupture of the conduit and damage to the insulation on the conductors within it when subjected to freezing temperatures. Some weight is given to the requirement for this seal by Section 3015 of the Code, which states that if portions of an interior raceway system are exposed to widely different temperatures as in refrigerating of cold storage plants, provision shall be made to prevent the circulation of air from a warmer to a cooler section through the raceway. While a dairy barn cannot be likened to a refrigeration or cold storage plant, the temperature differences are somewhat similar during cold weather periods, and the problem of condensation in open raceways is identical. Therefore the rural wiring inspector who prohibits the installation of an open vertical run of conduit used for the protection of a circuit conductor extending up through the hayloft is, I believe, properly interpreting the Code when he requires that the upper end of this raceway be sealed with a sealing compound to prevent the circulation of air through that conduit. Short horizontal runs of conduit extending through partitions or beams do not, of course, have the problem of being exposed to different temperatures. However, they do provide a path for air and a depository for moisture and hay chaff and therefore should be sealed with some suitable insulating compound. In some areas inspectors are recommending that such short lengths of piping be completely filled with compound, especially where nonmetallic sheathed cable is being utilized.—G.R.

Busway Support

Q. *Section 3643 of the Code requires special supports for busways installed in a vertical position. How can an Inspector determine that such special supports are used?*—J.McD.

A. This question was brought to the attention of the Underwriters Laboratories a few years ago since this question of proper support might be difficult for an Inspector to determine. As a result of this question, the U. L. have included in their standard covering Busways a provision which requires that busways and supports that are approved to be used in a vertical position shall be marked to cover this feature.—B.A.McD.

Gasoline Pump Wiring

Q. *In a gasoline pumping station, consisting of a pump and motor room and an electrical control room (consisting of electrical service equipment, lighting panel and pump motor controllers) separated by a concrete partition wall with no openings, does the Code require electrical equipment in the control room to be explosion-proof? The conduit feeders to motors and lighting in the pump and motor room being sealed before leaving the control room. The only openings in the control room being to the outside of the building.*—L.E.P.

A. I assume from your question that the gasoline pump and motor, which introduces a Class 1, Group D hazardous location, is cut off from the electric service and control equipment by a fire resistive wall with no openings that would permit gasoline fumes to enter the control room.

Under the conditions set forth, you have isolated the hazardous area from the non-hazardous area, and it would not be necessary to install the special wiring and equipment required by the Code for a Class 1, Group D location in the section that does not contain the gasoline pump. This opinion is based on N. E. Code requirements. I would consult the local Inspection Bureau for any special requirements that might exist.—B.A.McD.

Service Conductors

Q. *On a four wire three phase service supplying both light and power, can the conductor supplying the high phase be of smaller copper*

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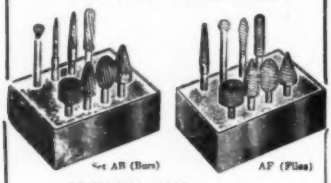

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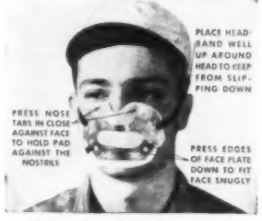
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than the other ungrounded conductors? —F.B.S.

A. A service drop consisting of four conductors supplying three phase power served from a delta connected transformer bank may utilize a smaller conductor for the high leg or wild phase as that phase cannot be used to supply a lighting load, and therefore the conductor need be no larger than is necessary to supply the motor load. Section 2304 simply states:

"Service conductors shall have adequate current-carrying capacity to safely conduct the current for the loads supplied without a temperature rise detrimental to the insulating covering of the conductors, and shall have adequate mechanical strength."—G.R.

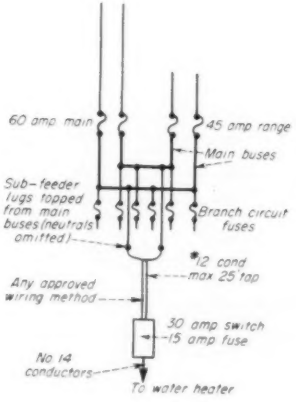
Combination Main Switch-Range Panels

Q. *In practically all residence installations, we install 60 amp main and 45 amp double pullout panels with the required number of plug fuse branch circuits. These panels also have sub feed lugs tapped from the main bus and protected by the 60 amp main. The circuit diagram on the panel shows the water heater circuit supplied from these lugs. The average residence water heaters are 1000 or 1500 watts, installed on a single circuit as specified in our city ordinance. The water heaters of the above ratings hooked up to these lugs would be over fused approximately 600 and 400% respectively. This is against provisions of the code (Sec. 2122-b). As I can see, the fuses would serve as protection against short circuits as there is no danger of overloads if the circuit supplies only a single appliance and the circuit conductors are of sufficient current carrying capacity to supply the appliances. These panels are approved by Underwriters Laboratories for such use as illustrated on the circuit diagram. I would appreciate your opinion on this matter as I can't find any information in the code governing the installations at these lugs.* —L.W.

A. You are correct in your analysis of the Code that Section 2122-b would be violated by the procedure outlined. In order to correct the situation and satisfy the Code you may proceed as permitted by Section 2434-d. The rule is known as the 25-foot tap rule and permits you to connect a small conductor without overcurrent protection to a larger conductor provided the smaller conductor has a current carrying capacity at least one third that of the supply conductor and provided this tap is protected from mechanical injury, is not over 25 feet long and terminates in a single set of fuses or a circuit breaker which will limit the load on the tap to that permitted by Tables 1 and 2 of Chapter 10.

A 1500 watt, 220 volt water heater requires about 7 amps for operation and a No. 14 conductor. Since the tap is made to a conductor fused at 60 amps, the tap must have a current carrying capacity at least one third of 60 amps which is 20 amps and No. 12 wire. We can therefore, connect No. 12 wire to the water heater terminals and run not more than 25 feet provided we terminate in an overcurrent device which limits the load on the tap to the capacity of the tap. I have added to your drawing how this tap could be installed. I have also shown a 30 amp disconnect switch to satisfy Section 4241-b covering disconnects for appliances.

It is also possible to use the 5 tap rule covered by 2434-c if all the details are satisfied.—B.A.McD.



Shielding Rubber-Insulated Conductors

Q. *In the very near future, I will do inspection on the installation of power and lighting. I see by the plans and specifications that there will be a run of three No. 2 conductors in 2½-inch conduit. This circuit will be 4160 volts and have a 300 kva load and will be a little over 1600 ft long. The wires are to be single and to be shielded. The question in my mind is whether each wire being shielded will cause induced currents as if they were installed in separate conduits, and*

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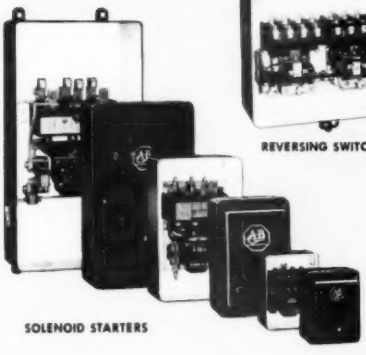
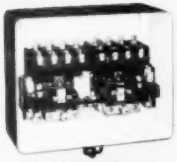


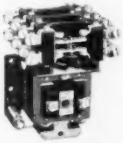
SOLENOID STARTERS



REVERSING SWITCHES

MANUAL STARTERS

TIMING RELAYS



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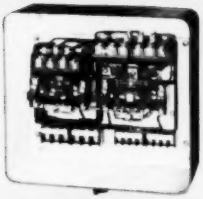
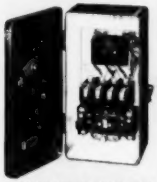


MULTISPEED STARTERS



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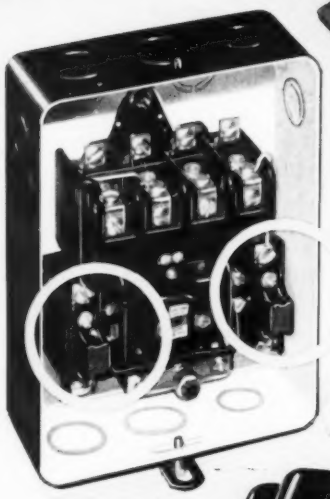

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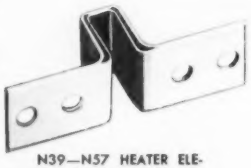
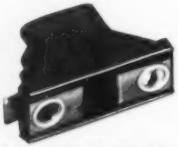


N39—N57 HEATER ELEMENTS for motor full load currents 25 to 157 amp.



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QUALITY

that paragraph 3018 of the code would forbid such an installation?—L.E.M.

A. Section 7117 of the N. E. Code requires non-leaded, fibrous covered, rubber insulated conductors, operating at voltages and conditions covered by the Table, to have metallic or semi-conducting shielding for the purpose of confining their dielectric field. It appears to me that the specifications, from which your question has arisen, definitely intends to satisfy the requirements of Section 7117 of the Code.

I do not believe that the use of the three shielded cables installed in the same conduit would violate the requirements of Section 3018 of the Code. I assume the three conductors comprise a three phase circuit. It appears to me that under such conditions, overheating by induction will be eliminated since the conductors are so grouped in one enclosure that the induced currents will be neutralized. It also follows that the metallic shield usually consists of a thin ribbon of copper and the semi-conducting shielding also consists of materials which are not considered magnetic materials. Steel conduit is highly magnetic and when ac conductors are improperly used in such an enclosure the inductive effect is considerable.—B.A.McD.

Bushing Flexible Conduit

Q. *I wired a kitchen in a hotel installing 26 outlets for which I filed with Underwriters. I received three violations on the wiring, two were not mine and had been installed by someone else. I phoned the inspector and he said the violations were there; he was not interested in who did the wiring and wanted them removed. Should the violation be charged to me? The other violation was no fibre bushings in Greenfield conduit, supplied by the manufacturer with hi hat recessed fixtures. I can't find in the code where fibre bushings are required in Greenfield flexible conduit. By the way the Greenfield ends in a 4-inch octagon clamp box.*—D.W.

A. While your first question does not concern the Code, I will be glad to comment as an Inspector, who has experienced similar incidents. When an inspector visits a job on which you have filed a request for inspection, it often occurs that he is unable to tell the difference between the work you installed and that of some other contractor. As a result,

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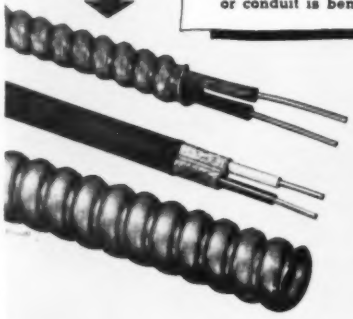

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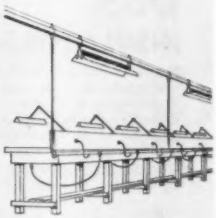

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he does not wish to consult the owner at that time since such a conversation might result in an unjust criticism of your work to the owner. Most inspectors absolutely avoid discussing the condition of the work with the owner in respect for the application which has been filed. Any comments on the work covered by the application must first go direct to the contractor and not the owner. In order to avoid any error in this respect, the inspector may notify the contractor of defects found on the job even though he may not be certain who is responsible. He can't ignore the defects.

This procedure is agreeable to many contractors. They contact the inspector and discover the facts. If they are not responsible for the conditions, they then contact the owner and in most cases he will immediately authorize correction of the work. If the contractor does not wish to take such action, however, and advises the inspector that he is not responsible for the defects, I then believe it is up to the inspector to notify the owner accordingly.

Section 3347 of the Code requires the wires of armored cable to be protected by an insulating bushing inserted between the conductors and the armor. This rule, however, does not apply to flexible conduit. If the flexible conduit in question is $\frac{3}{8}$ inch in size, it may easily be confused with armored cable. There have been cases where rubber conductors have been removed from armored cable and heat resisting wires installed in their place. Perhaps this occurred in this case. If you are certain that this did not occur and flexible conduit is used, no insulating bushing would be required.—B.A.McD.

CODE BREAKFAST discussion notes were prepared and presented by William P. Smith, chief electrical inspector, Department of Water Supply, Gas & Electricity, City of New York (right), assisted by John W. King, Chief City Engineer, Providence, R. I., at Eastern IAEI meeting.

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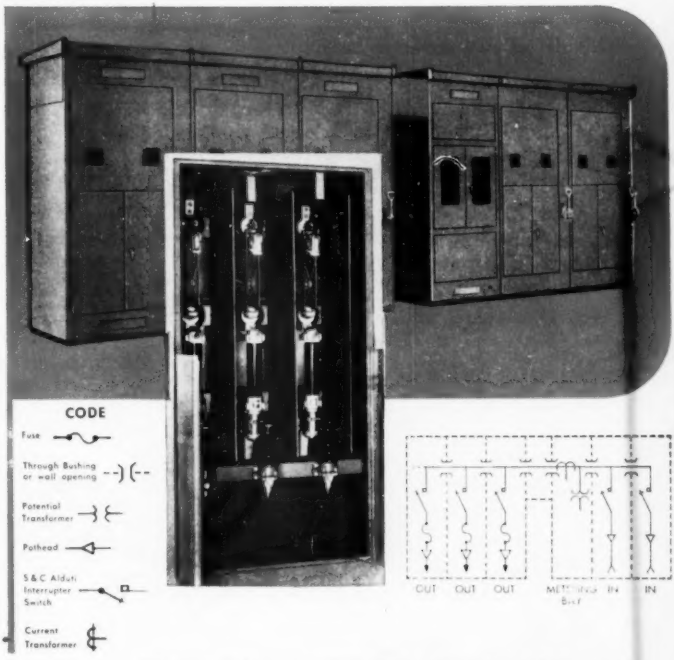

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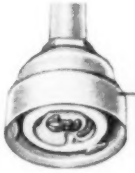

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Where to Find Helpful Information

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MODERN electrical construction, maintenance and repair has become so complex that it is far beyond the ability of any one person to acquire a rounded knowledge solely from his own experience. Yet men in our field are constantly broadening their fields of endeavor by studying the experiences and conclusions of others.

The accompanying compilation of recommended reference material does not attempt to list all available data. A notable omission is the great wealth of useful literature compiled by manufacturers and freely offered to those who desire to make use of it. Much of this material has already been brought to the attention of readers on the pages of our Readers' Service department. Another intentional omission is the long list of textbooks written solely for the student rather than for the practical man in the field.

Incomplete as this list is, however, it should serve as a useful reference check-list for contractors, design engineers, maintenance personnel and motor shop operators.

National Electrical Code: 1951 (40th Anniversary) edition. 412 pages. $1.00. Published by National Fire Protection Assn., Boston, Mass. All recent changes and official interpretations are clearly indicated. Cross index makes it easy to find code rulings on any type of electrical installation.

National Electrical Code Handbook: 6th edition. Arthur L. Abbott. 633 pages. $4.00. Published by McGraw-Hill Book Co., New York City. A wealth of information pertaining to electrical installations in accordance with code provisions, discussing homes, factories, hazardous locations, signal systems, high voltage equipment and motor installations. Gives rules and requirements for all jobs; what they mean, how to apply them.

Electrical Code Diagrams: B. Z. Segall. $3.00. Published by Code Data Publishers, Atlanta, Ga. Loose-leaf reference, explaining the NEC with text, diagrams, examples and explanation for establishing or changing code provisions. Loose-leaf feature permits replacement of individual pages as changes in the code are made, resulting in a constantly up-to-date interpretation.

Electrical Specifications—1949: Reprint from Electrical Construction and Maintenance. 68 pages. $1.00. McGraw-Hill Publishing Co., Inc., New York City. A manual of specification procedure with example specification for electrical construction and installation. Includes service entrances, grounding, transformers, switches and panels, feeders, branch circuits, signal and communication systems, lighting, motors and controls.

Electrical Estimating: Ray Ashley. 307 pages. $7.50. Published by McGraw-Hill Book Co. Selection and training of electrical estimators, proper use of estimating tools, cost of preliminary estimates, preparation of final bid sheets, estimating forms and practices, study of plans and specifications, listing and checking materials, sample estimates and cost data make this book unusually valuable.

Source of Engineering Information: B. H. Dalton, Librarian, U. of Calif. $4.00. Published by University of California Press. Concise and complete reference listing all research previously published in the engineering fields.

Handbook of Engineering, revised: Waterbury. 386 pages. $2.50. John Wiley & Sons, Inc., New York City. Compact encyclopedia of mathematics, electrical and illuminating engineering, radio and electronics, algebra and trigonometry, integral and differential calculus, mechanics and heat engineering. Formulas for circuits and apparatus include fields of motors, transformers and generators. Tables include logarithms and natural values for numbers and triangle functions.

Standard Handbook for Electrical Engineers (8th edition): Edited by A. E. Knowlton and R. M. Shoop of *Electrical World* editorial staff; over 100 contributing engineering authorities. 2311 pages. $12.00. Published by McGraw-Hill Book Company, New York, N. Y. A comprehensive 26-section presentation including all previously published information and latest developments on nuclear energy, radar, induction and dielectric heating, plastics, conductors, generators and transformers, illumination, welding, codes and standards, prime movers, power distribution, electro-chemistry and properties of materials.

American Electricians' Handbook (6th edition): T. Croft, revised by C. Carr. 1734 pages. $6.00. Published by McGraw-Hill Book Co. Detailed descriptions, rules, methods, pictures and practical data for installing, operating and maintaining electrical equipment are discussed, including recent advances in electronic tubes and circuits.

Contracting As A Profession: F. W. Lord, founder and president of Lord Electric Co. Published by Richard R. Smith, New York City. Negotiations between owners and contractors, billing procedures and competitive bidding are explained with objective of placing contracting business on a professional level.

Best's Safety Directory for 1950–1951: 511 pages. $5.00. Published by Alfred M. Best Co., New York

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Most Gedney fittings are unbreakable malleable iron – special hot dip galvanized for maximum life. *All* Gedney fittings are machined and threaded with utmost accuracy. What's more, Gedney makes a complete line, and many items have special features. On your next order specify Gedney fittings – today's best buy.

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City. This catalog of available equipment covers the entire field of fire protection and control, hygiene, first aid, sanitation and safety. It combines the features of a safety manual, directory index, encyclopedia and reference source in a single volume. The arrangement of subjects serves as a check-list of industrial hazards, many frequently overlooked.

Electrical Reference Book: E. S. Lincoln. With supplement, over 1400 pages. Price $5.00. Published by Electrical Modernization Bureau, New York City. The entire field of industrial electrical operation from service entrance through utilization equipment is covered in this reference book. Installation covers economic factors, selection of equipment, layout, application and control. Operation includes inspection, maintenance, testing, surveys, analysis of performance, operating costs and correction of faulty operation. Sections are devoted to relations with manufacturers, plant management, contractors, consultants and utilities. Utilization equipment includes discussions on motors, lighting, heat applications, welding, electroplating, electric trucks, storage batteries, communication equipment.

Architect's and Engineer's Data Book: Compiled and published by Westinghouse Electric Corp. 362 pages. Price $5.00. Electrical equipment, application features, how to select, dimensions, typical specifications and engineering data make this a useful reference book. Included are discussions on circuit breakers, capacitors, switchgear, transformers, lighting, panelboards, secondary distribution networks and unit power centers. Over 100 pages are devoted to product application and distribution systems, including a reprint for the AIEE manual on Electric Power Distribution for Industrial Plants.

Electric Distribution Fundamentals: Frank Stafford, distribution engineer, Cincinnati Gas & Electric Co. 252 pages. $3.50 McGraw-Hill Book Co. The planning, design, construction, operation, maintenance, inspection and supervision of electrical distribution systems are discussed in this book. Subject matter covers application of transformers, design of carrying lines, problems of maintenance, selection of equipment, voltage drop, wire size calculations, power factor improvement and inductive reactance.

Practical Electrical Wiring (3rd edition): H. Richter. 574 pages. $3.75. Published by McGraw-Hill Book Co. Comprehensive course of instruction for the apprentice, covering residential, farm and industrial wiring methods, beginning with underlying principles and showing with numerous illustrations exactly how to complete each wiring job.

The Lineman's Handbook (2nd edition): E. Kurtz. 652 pages. $5.00. McGraw-Hill Book Co. Handy reference and guide including principles, data, methods and precautions on all aspects of line work. Describes materials of line construction, poles, conductors, hardware, tools and apparatus. Discussion covers installation, testing, operation, maintenance.

Transformer Principles and Practice (2nd edition): J. B. Gibbs. 232 pages. $4.00. Published by McGraw-Hill Book Co. Construction and use of transformers, underlying principles, applications, connections, testing, care and economics are discussed, with pointers on polarity, ratio adjustment, mechanical forces.

Steel Electrical Raceways: 131 pages. $1.00. Published by American Iron and Steel Institute, New York City. Deals with design and installation problems of rigid steel conduit and electrical metallic tubing, listing tools required for installation, references in the NEC and illustrations to explain construction methods.

NEMA Standards for Power Switchgear Assemblies, revised: 64 pages. $4.00. Published by National Electrical Manufacturers Association, New York City. Covers ratings, testing, manufacture and applications of assemblies of switchgear devices such as switches, interrupting devices and controls, metering, protective and regulating equipment. Also included are facts covering standards, abbreviations, device numbers and symbols, instructions for installation and operation.

Power Capacitors: R. E. Marbury, Westinghouse Electric Corp. 205 pages. $3.50. Published by McGraw-Hill Book Co. Discusses methods for determining type and number of capacitors required to correct low power factor and low voltage. Also included are explanations on capacitor materials and characteristics, ratings, design and manufacturing problems, application of shunt capacitors to industrial power circuits, high-frequency and dc units, fuses, switches and connections. Written for college, design and application engineers rather than for research and production.

Power Factor in Your Plant: W. C. King. 208 pages. $3.00 Published by Cornell-Dubilier Corp., S. Plainfield, N. J. Written for practical maintenance engineers, this book answers every-day questions such as determination of power factor, effect on voltage drop, definition of synchronous motors, economic comparisons between distribution systems and capacitors, and construction of capacitors. List of trade-press articles on related subject matter is also included for additional reference.

Protection of Electric Circuits and Machines: C. F. Hedlund and A. L. Brown. 72 pages. $2.00. Published by Associated Factory Mutual Fire Insurance Co., Boston, Mass. A wide variety of electrical protective devices are described as to purpose, requirements, construction, characteristics, operation and advantages. Types discussed include fuses, circuit breakers, protective relays, and overload protection for motors. Specific applications cover generators, transformers, motors and motor circuits, both ac and dc.

Electrical Machinery (3rd edition): Fred A. Annett, associate editor of *Power*. 460 pages. $6.00. Published by McGraw-Hill Book Co. The installation, operation and maintenance of electrical machinery with discussions on magnetism, properties of permanent and electromagnets, electric circuits, instruments, 2- and 3-phase wiring.

Fractional Horsepower Electric Motors (2nd edition): Cyril G. Veinott, Westinghouse Electric Corp. 554 pages. $5.00. Published by McGraw-Hill Book Co. Operation, maintenance and repair of small motors is discussed in terms of split phase induction units, thermally protected motors, dual voltage motors, special purpose motors and selecting proper motors for specific jobs.

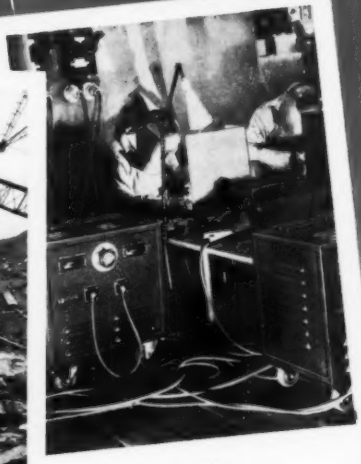
Look what you can do

Soak it in Acid Water

It won't penetrate the live Neoprene cover. This jacket does more than keep water out; it will not swell and deteriorate when exposed to oil and grease.

Drag it over rock–

The tough cover will take abuse like an elephant's hide. Amerclad cables are famous for their abrasion resistance. They can be dragged over sharp rock and rough floors without damage.



Flex it–

Amerclad Welding cables are made from extra-fine strands to eliminate strain on the operator's wrists. This also allows the cable to be easily snaked into restricted quarters.

AMERICAN STEEL & WIRE COMPANY
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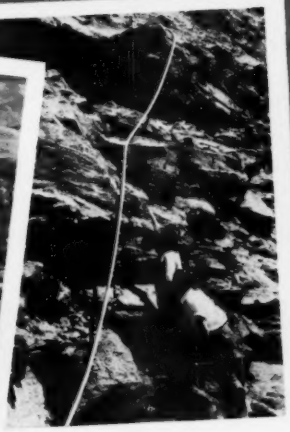
TRADE MARKS
AMERICAN ELECTRICAL WIRE AND CABLE
UNITED STATES STEEL

with AMERCLAD:

Reel it in or out-

Mine operators like the way Amerclad stands up under the continuous reeling necessary on so many mine machines. Here, the cable is reeled in and out—all day long—on a minimum diameter pulley.



Expose it to sunshine-

Amerclad cables are designed to give top service even when exposed to sunshine, ozone, oil or grease. This chemical protection, combined with the mechanical strength of Amerclad, assures you of long life even under the most punishing conditions.

Hang it over cliffs-

Amerclad has the strength to resist abrasion. Even though it sways in the wind and grinds against rock particles, the tough Neoprene jacket will bounce back for more.

WRITE FOR INFORMATION. There is an Amerclad cable or cord to meet your exact needs. Amerclad cables are designed for specific uses on portable machinery, tools, motor and generator leads, welders, machine tools, appliances, mining machinery—wherever you need a heavy-duty cable that will give long life and freedom from trouble.

Get in touch with your nearest AS&W office or write: American Steel & Wire Company, Rockefeller Building, Cleveland 13, O.

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American Electrical Wire and Cable

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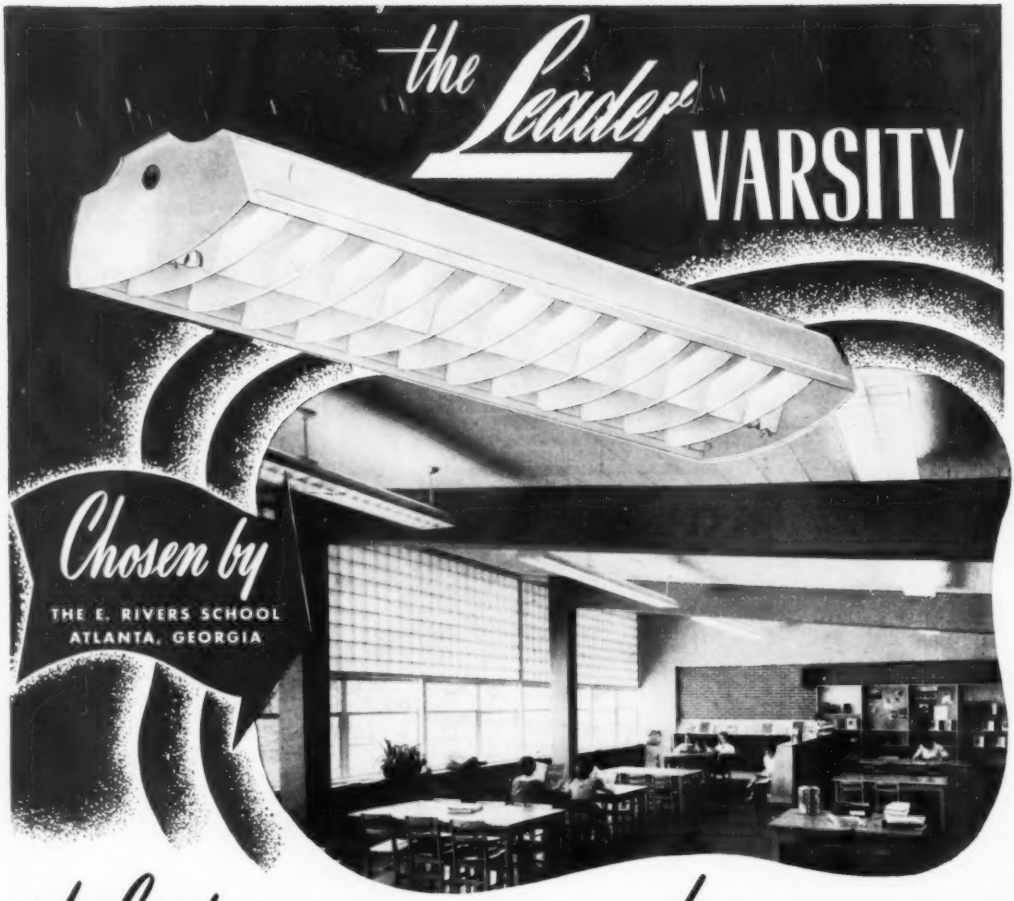

to Create IDEAL SEEING CONDITIONS for YOUNG AMERICA

It is only logical that when really important lighting jobs are up for bids . . . architects and contractors look to Leader. That's what happened in the case of the E. Rivers School at Atlanta. Architects Stevens & Wilkinson, and contractors Brittain & Pattillo, agreed that a dual component luminaire was required. The Leader VARSITY was the obvious choice because 60% of its output is directed downward and 40% upward, creating ideal seeing conditions. And VARSITY's economical price runs well within the school budget. . . . Whatever your next lighting problem may be — classroom, office, library, store, bank, institution or industrial plant — look to Leader and see the logical and profitable answer.

Sold and installed by the better electrical dealers and contractors

Leader *America's No. 1 Lighting Equipment Manufacturer*

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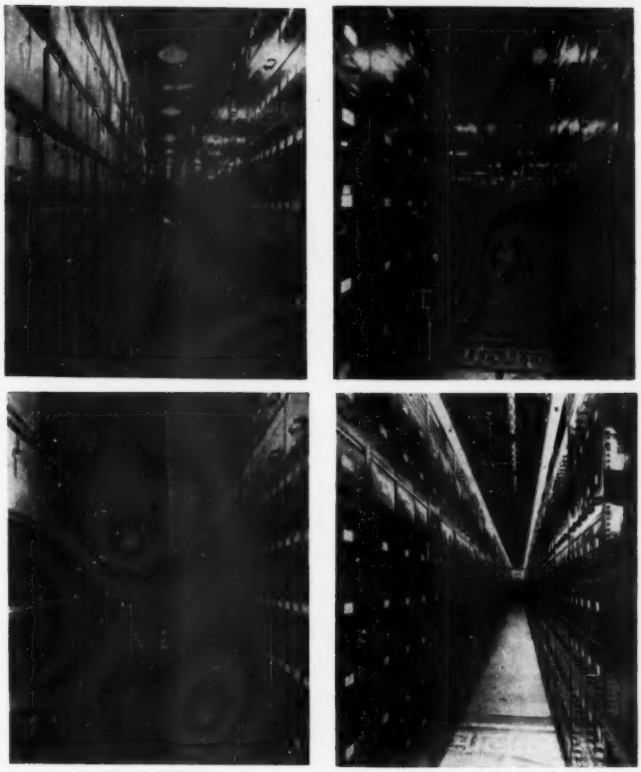
Modern Lighting



BEFORE AND AFTER views of the upper and lower filing decks indicate the effectiveness of installing continuous rows of fluorescent lamps in the record bins of the Pennsylvania Company for Banking and Trusts, Philadelphia.

Bank Records Filed Under Continuous Rows Of Fluorescent Lamps

Records are filed and located quickly, accurately and safely in the storage bins of the Pennsylvania Company for Banking and Trusts, Philadelphia, where continuous rows of fluorescent lighting are installed above the 9-tier cabinet bays. Planned by R. S. Melville (PC for B & T), designed by G. T. Anderson Jr. (Philadelphia Electric), and installed by E. B. Barber (Independent Wiring Co., electrical contractor), the installation utilizes both symmetric and asymmetric reflectors manufactured by Keystone Electric.

In all, there are six double-deck filing bays, separated by steel grating walk-ways. Lower bays are lighted by two rows of single 48-inch asymmetric units, positioned just in front of the cabinet faces, while upper bays are lighted by 96-inch single-lamp industrial fixtures with symmetric reflectors, located above the center lines of the file aisles. Upper units are operated at 425 milliamps. Lower lamps are operated at normal circuit characteristics.

Lighting intensities range from 32 footcandles at the floor level of the lower deck to 105-ft-c, 9 feet above the lower floor. The upper deck receives 46 footcandles at walk level, 25-ft-c 4 feet up, and 17-ft-c 9 feet up. File cabinets are forest green having a 22% reflectance factor. Lower bay floors are light linoleum with an r.f. of 0.46, while the upper deck ceiling is painted a 20% reflectance grey.

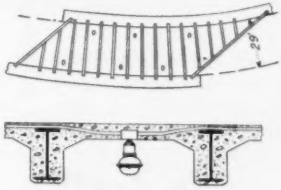
The installation is a tremendous improvement over the former uneven, low intensity, glaring incandescent arrangement.

Shielded Mercury Lamps For Underpass

As the number of vehicles in use increases, municipal governments are being forced to think more and more about safety. Wider roadways, cloverleaf intersections, underpasses and higher levels of illumination for nighttime seeing are some of the safety measures being taken to keep traffic accidents down.

In Philadelphia, in the Hunting Park Ridge section, an average of 6.9 footcandles was measured on the roadway of a new underpass after six months operation. This is obtained from an installation of Westinghouse OV-20 luminaires using E-H1 20,000-lumen mercury-vapor lamps, staggered to provide even distribution of light on the pavement, and positioned between beams so that glare is almost completely absent. These beams are approximately 28 inches in depth, forming an effective series of baffles. The roadways are 12 feet wide, separated by a 2-foot slope curb, and flanked by two 18-inch sidewalks. Roadway clearance is 14 feet to the bottom of the beams.

Walls and ceiling are natural concrete with a 30% reflectance factor, and vertical illumination on these walls (5 feet above the sidewalks) measures 4.1 footcandles. Multiple distribution is installed to insure lighting continuity, with 115/220-volt ballasts located



Detail Plan for Park Underpass

LUMINAIRES and mercury-vapor lamps are shielded by the beam construction, making it possible to materially alter conventional mounting heights without lessening the seeing comfort of motorists driving through the underpass.

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the one source lighting line

55 YEARS
OF
EXPERIENCE

For 55 years Kayline has been manufacturing lighting fixtures of high quality, lasting performance and distinctive design. Our engineers, some with as many as 42 years of service with Kayline, are qualified to solve your residential, industrial and commercial lighting problems. Time-tested experience has placed Kayline high among the leaders in the lighting field.

See our illustrated Catalogue #50 for the incandescent, fluorescent or slimline lighting fixture to meet your specifications. Write for it on your business letterhead.

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THE KAYLINE COMPANY
2480 EAST 22nd STREET
CLEVELAND 15, OHIO

KAYLINE
the one source lighting line

GOOD VISIBILITY in the underpass is illustrated by the pedestrian standing in the roadway approximately 50 feet from the photographer. Footcandle levels on the pavement are approximately 7, with brightness ratios less than 2:1.

in receptacles recessed into the underpass walls. Wiring is in metal conduit buried in the concrete.

The approach roadways leading to this 110-foot long, slightly-curved underpass are also lighted with OV-20 luminaires using E-H1 lamps, so color quality is not changed. And, since brightness ratios in the culvert are less than 2:1, comfortable seeing and safe driving conditions result.

This installation illustrated the fact that conventional mounting heights and spacing ratios can be materially altered, if adequate shielding is provided to eliminate direct glare and disperse the intensity.

The lighting plan was developed by H. E. Mason, Street Lighting Engineer, Bureau of Lighting and Gas, City of Philadelphia; J. H. Wenner, Lighting Sales Engineer, Westinghouse Electric Corp., and the Welsbach Corp., electrical contractors.

Ski Slope Lighting Doubles IES Standards

"The Poor Man's Country Club" is the local tag for Drumlins Golf Club and Sports Center in Syracuse, New York, where a 5-acre ski slope recently was illuminated to provide visibility for safe night use. The IES standard of 0.5 footcandles, and the NEMA standard of 0.03 watts per square foot, recommended for practice slopes, are more than doubled by the installation of pole-mounted Crouse-Hinds floodlights. Designed

GOOD VISIBILITY for night sports is provided by combination of 1000- and 500-watt floodlights mounted on 30-foot poles. Illumination and connected lighting load exceed both NEMA and IES standards.

GOULD

Plus-Performance Plan

. . . SHOWS YOU HOW ACCURATE RECORDS

LENGTHEN BATTERY SERVICE!

Keeping of accurate records is vital to the conservation and extension of essential battery power. The GOULD PLUS-PERFORMANCE PLAN makes the keeping of battery records easy by providing you with full information on how to test your batteries, and charts and forms for recording test data.

This timely plan puts at your disposal a complete system of manuals, articles, specifications, bulletins, charts, graphs and forms explaining and illustrating how to select, charge and handle, maintain and determine the condition of your batteries. This material, which can increase battery service as much as 50%, is FREE to battery users, without obligation. A request on your letterhead will bring descriptive booklet by return mail.

DAILY RECORD SYSTEM CONTROLS BATTERY MAINTENANCE

Number each battery and, as each is installed, read and record its specific gravity and temperature on chart illustrated below (these charts are FREE on request to users of the GOULD PLUS-PERFORMANCE PLAN). Record also, date each battery is put into service, and vehicle to which each is assigned. When each battery is charged, specific gravity, temperature, time, setting of ampere-hour meter and the date and amount of water are recorded.

Such a record tells 1) whether batteries are fully charged when placed in service; 2) number of hours each battery was in service; 3) if batteries were discharged below normal value; 4) whether batteries are being properly charged; 5) when batteries should be changed to prevent overworking and resultant failure during shift.

The GOULD "Thirty" with "Z" PLATES—
America's Finest Industrial Truck Battery

GOULD MOTIVE POWER BATTERY--CONTINUOUS RECORD

User_____ Date_____ 19__

Address_____

PILOT CELL AND VEHICLE METER READINGS

The "Start of Charge" readings to be taken just after charge is started. The "End of Charge" readings to be taken just before charge is stopped.

PILOT CELL IS CELL NO. _____

After every 50 or so gravity readings of the pilot cell, a different cell should be used as a pilot in order to avoid lowering of the gravity due to possible loss of a small amount of electrolyte each time the gravity is read.

INDIVIDUAL CELL READINGS (To be recorded once every three months for each battery)

Battery No. _____

Date_____

Specific Gravity readings taken

A_____

B_____

Voltage readings taken

A_____

B_____

Charging Current while taking voltage readings _____ Amps.

Specific

REGULAR CHARGE READINGS – INCLUDING BOOSTS BUT NOT INCLUDING EQUALIZING CHARGES

Date	Vehicle No.	Battery No.	Start of Charge: Time Started	Timer Setting Hours	Amp. Hour Meter Reading	Charge Rate Amperes	Pilot Cell: Sp. Gr.	Pilot Cell: Temp.	End of Charge: Amp. Hour Meter Reading	Charge Rate Amperes	Pilot Cell: Sp. Gr.	Pilot Cell: Temp.	Time Stopped

GOULD STORAGE BATTERIES

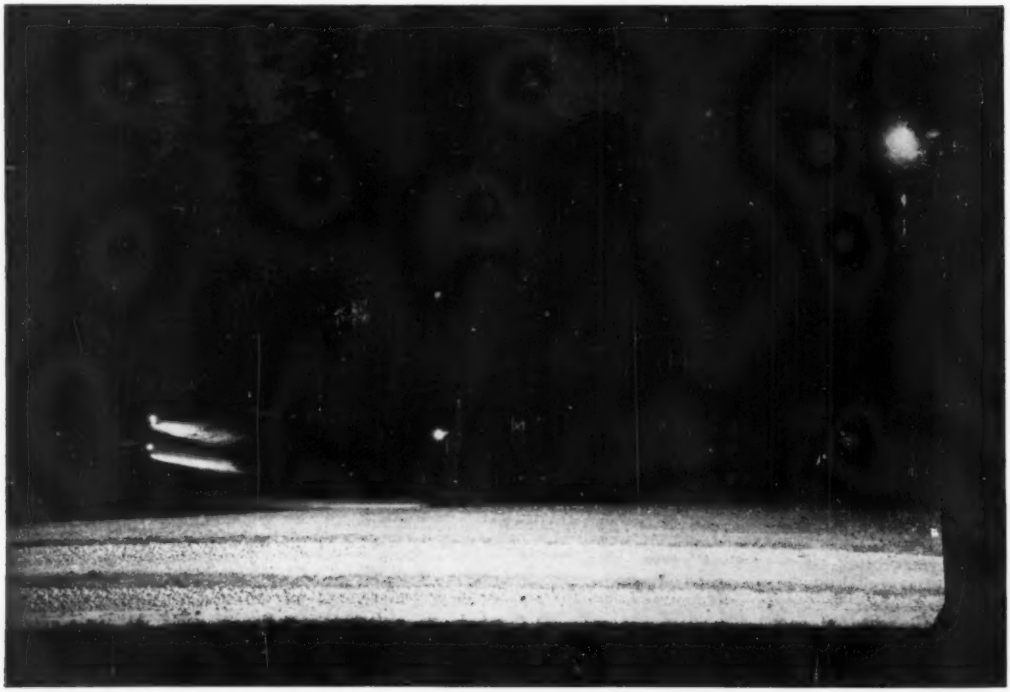
GOULD-NATIONAL BATTERIES, INC., TRENTON 7, NEW JERSEY

Always Use Gould-National Automobile and Truck Batteries

NEOPRENE-JACKETED CABLE REPLACES ALL OVERHEAD

"Lightweight and flexibility simplify installation. No failures in thousands of feet," reports Pennsylvania contractor.

Mr. L. Donald Miller, of Kennett Square, Pa., is the contractor who installed the new outdoor lighting system on this 150 acre estate in historical Brandywine Valley. Former overhead lines, one of which was blown down in a wind storm, were replaced with neoprene-jacketed cable buried directly in the ground. The system was also extended to provide lighting around a pond several hundred feet from the house. In commenting on the job, Mr. Miller says, "In the past five years, I've installed thousands of feet of this cable. I haven't had to make a service call because of a cable failure on any job I've put in. We like the way the cable handles, too. It's light and flexible. As you can see here, two of us can handle long runs with no trouble. It's been a real timesaver in my business."



INSTALLED UNDERGROUND WIRING ON COUNTRY ESTATE

This shallow ditch is all the preparation needed to install neoprene-jacketed cable. Lines are run from distribution box in cellar of main building. After cable was laid, earth and sod were replaced.

"Paying off" cable to cross driveway on way to pond. Under the driveway, cable was run through metal conduit in order to assure adequate protection against crushing from weight of vehicles passing over it.

Cable being installed to provide light for chicken house. Neoprene's resistance to soil acids encountered in such areas and cable's ability to withstand crushing from settling earth makes direct burial practical.

Conduit leading to light fixture was used for neat appearance rather than protection. Neoprene's superior resistance to sunlight and weathering makes it ideal for exposed runs, too.

Neoprene-jacketed cable is made by manufacturers in single and multiple conductor types, in voltage ratings to fit your requirements. Your supplier will be glad to tell you more about this better cable and the types he carries. And, if you'd like to read about new and interesting applications of neoprene, they are fully described in each issue of the Neoprene Notebook. Write today for your free subscription. E. I. du Pont de Nemours & Co. (Inc.), Rubber Chemicals Division T-11, Wilmington 98, Del.

NEOPRENE

The rubber made by Du Pont since 1932

DU PONT

BETTER THINGS FOR BETTER LIVING . . . THROUGH CHEMISTRY

SOLA *Sequenstart* ™
FLUORESCENT BALLASTS
last longer

Cool operation is vital to long ballast life. Excessive heat deteriorates impregnating varnish, enamel wire insulation, compound, and invariably causes premature capacitor failure. SOLA Sequenstart* Fluorescent Ballasts last longer because of circuit design and capacitor ventilation.

• COOLER CORE AND COIL

Primary coil heat rise is significantly lower because the Sequenstart* Circuit greatly reduces the amount of metal required. This minimizes copper and iron losses, and consequently results in lower ambient temperatures. (Core and coils occupy the left section of the cut-a-way)

• VENTILATED CAPACITOR

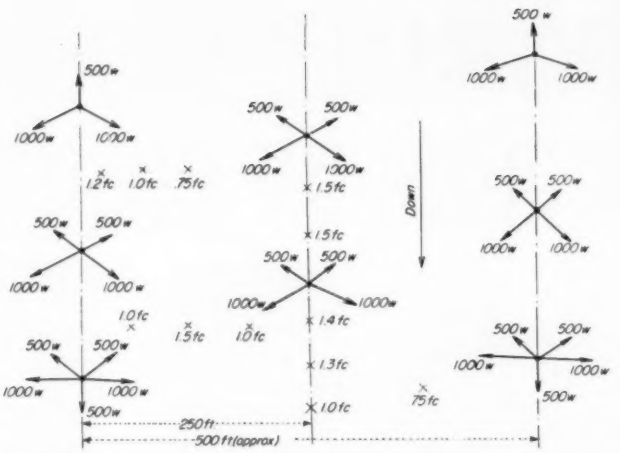
Capacitor life is inversely proportional to operating temperature capacitor failure is the single greatest cause of ballast malfunction. The patented SOLA ventilated capacitor compartment insulates the capacitor from coil heat by two walls and a buffer of air. (Illustrated by the right section of the cut-a-way)

The important property of longer ballast life is but one of many advantages you'll receive when you specify and install SOLA Sequenstart* Fluorescent Ballasts.

Write to us if you wish to be on our Fluorescent Lighting Technical Mailing List.

SOLA
Sequenstart ™
FLUORESCENT BALLASTS

SOLA ELECTRIC CO.
4633 W. 16th St., Chicago 50, Ill.



EIGHT POLES support sixteen 1000-watt and sixteen 500-watt floodlights, with the larger units trained in the direction of travel, and the smaller units directed up the slope to minimize shadows. Outer poles also support ski tow to carry enthusiasts to the top of the 100-foot hill.

by Don Brown, illuminating engineer for the floodlight manufacturer, the installation was by electrical contractors Bradley and Williams.

Using a design figure of 0.06 w/sf (twice NEMA standards), and multiplying by the 200,000-sq ft area, an initial lighting load of 12-kw was estimated. To theoretically produce this load would have required 16 fixtures on the slope (eight 1000-watt and eight 500-watt units) but, to achieve a better pole pattern and more even light distribution, the number of units was raised to 18; with ten 16-inch 1000-watt type MDB16 floodlights trained down the slope at an oblique angle to the line of travel, and eight 14-inch 500-watt MDB-14 units trained up the slope to relieve the shadows of skiers.

This brought the installed load *on the slope* to 14-kw and, in addition, 14 additional units were mounted to illuminate the area immediately adjacent to the slope, bringing the total connected lighting load to 24-kw. Poles are staggered on the slope, with three poles in each of the outside rows and two poles in the center row. Rows are 250 feet on centers, and floodlights are mounted at 30-foot heights. Light beam spreads are generally between 106- and 110-degrees; although a few heavy-duty 1000-watt ADE-16 units (previously purchased by the owners of the Sports Center) were equipped with 50-degree lenses to fill in the general lighting pattern and eliminate spottiness. Lenses used for slope lighting are clear, but diffusing lenses were installed on floodlights nearest to the entrances and exits of the ski tow to reduce filament glare.

Initial aiming of units was in accordance with a general aiming chart, but on-the-spot night aiming was found to be necessary due to the undulations of the terrain.

The success of the installation is indicated by the final lightmeter readings, taken when the slope was covered by 3 feet of snow. Illumination on the slope ranged from 0.75- to 1.5-fc (IES standard recommends 0.5) while the area extending outwards from the base of the slope is lighted between the limits of 0.75- and 1.4-fc. The slope drops 100 feet in a horizontal distance of approximately 350 feet.

Sports Arena Has Three Lighting Levels

One of the first gymnasiums to be lighted expressly for the purpose of taking motion pictures and televising championship basketball games is located in Philadelphia, where the University of Pennsylvania has installed three-level lighting in their Palestra. Highest of the three levels is 100 footcandles, for photographing sports events and making training films to visually aid high school students in perfecting their finesse in various games. Middle level is 55 footcandles (measured after two years of service) for television purposes. And lowest level is 30 fc (complying with I.E.S. recommendations) for satisfactory spectator and player visibility.

Those who have seen both the "before and after" installations are unusually impressed. For previous illumination averaged 3 footcandles on the

GREATER ELECTRICAL **AVAILABILITY** YOURS WITH

TYPE **"RA"** RIGHT ANGLE
ADVANCED DESIGN

MOTOR CONTROLS

ARROW **AH** HART

- JUST ½ THE SIZE • ½ THE WEIGHT
- BETTER PERFORMANCE
- 55% GREATER ARC RESISTANCE
- 30% SAVINGS IN INSTALLATION
- EASY TO WIRE AND TO INSPECT
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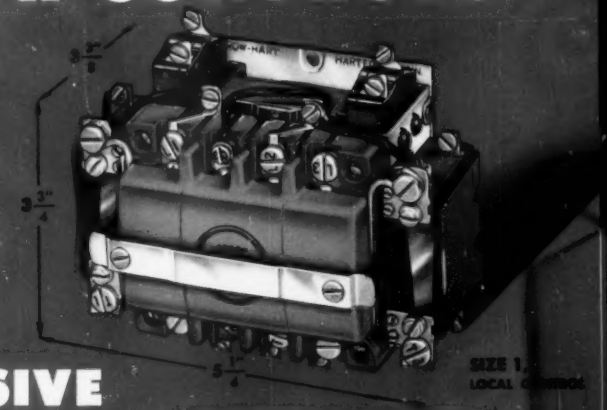
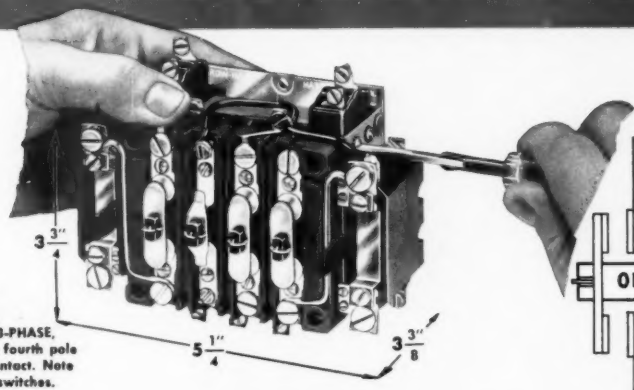
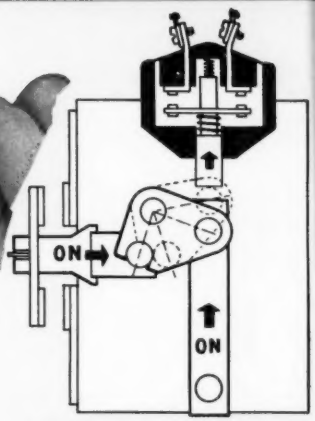


SIZE 1, LOCAL CONTROL

PLUS EXCLUSIVE ELECTRICAL INTERLOCK



SIZE 1, REMOTE CONTROL, Standard 3-PHASE, employing fourth pole holding contact. Note auxiliary switches.



Schematic pictures "RA" mechanism trip arm that automatically energizes interlock switch.

NO OTHER STARTER PROVIDES THIS VERSATILITY

Arrow-Hart's "RA", right angle, balanced mechanism with bellcrank fulcrum assures simple and positive force to operate the A-H auxiliary switch or switches. JUST TWO SCREWS and a completely enclosed electrical holding interlock switch provide dependable operation of numerous interlocking device combinations or signal lights. Men confronted with adding more circuits to serve more needs in restricted space have accepted and are benefiting from the many outstanding features of the A-H Type "RA" line of motor controls. Buy an Arrow-Hart starter today and see for yourself.

BUY WITH CONFIDENCE PROFIT BY PERFORMANCE

THE ARROW-HART & HEGEMAN ELECTRIC CO., HARTFORD, CONN., U. S. A.

ELECTRICAL CONTROLS

ARROW **AH** HART

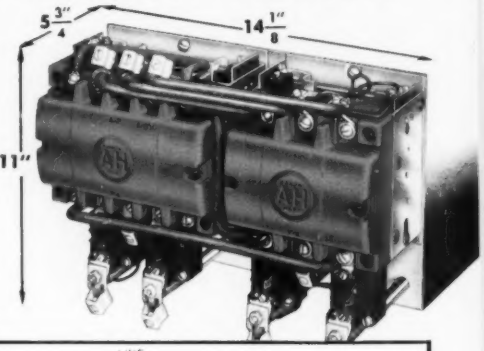
ESTABLISHED IN 1890

GREATER SAVINGS IN SPACE IN TIME IN DOLLARS

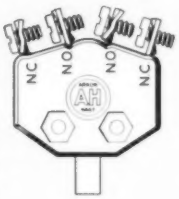
WITH ARROW AH HART TYPE "RA" MAGNETIC STARTERS

AVAILABLE WITH EXCLUSIVE AUXILIARY SWITCHES

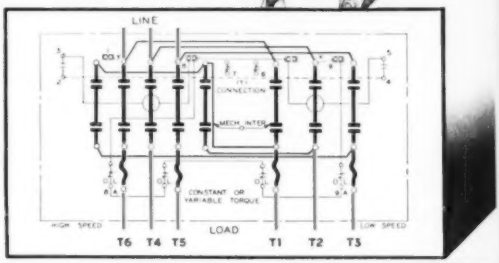
The Arrow-Hart motor control line is out front with an advanced design to provide industry with greater performance in smaller space. Adaptability is found in permitting the interlocking of numerous devices by means of a rugged and compact auxiliary switch. Another A-H exclusive, this utility switch is inserted from the top and requires but two screws for effective operation. The auxiliary is operated through contact with the operating lever arm of the "RA" mechanism. All auxiliary switches mount easily and quickly in one position.



THREE BASIC TYPES



Available in standard with BLACK button (one normally open), with RED button (one normally closed), and with GREEN button (one normally open and one normally closed). All auxiliary interlock switches are properly identified to aid in selection and safe application. One BLACK button (normally open) switch is furnished as standard on most motor starters.



TYPICAL INSTALLATION

Pictured to the right is a typical application of A-H auxiliary switches used in conjunction with an Arrow-Hart Size 3, 3-phase, 2-speed reconnected winding type of control. Note easy access to terminals and the big advantages of straight-thru front wiring. Additional information appears on the preceding page.

Available as Starter Units or in NEMA Enclosure Types I, IV, V, VII, IX

"RA" LINE A COMPLETE LINE

The patented "RA" design is available in magnetic starters and contactors in Sizes 0, 1, 2, 3 and 4 as units for panel installation or in NEMA enclosure types I, IV, V, VII and IX. The Explo-Safe line of explosion-proof housings features a Feraloy casting of new design at greatly reduced weight and bulk. There are "RA" controls to serve you best.

ARROW-HART

WRITE TODAY for bulletins describing Standard, Explosionproof and Weatherproof Motor Controls.

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THE ARROW-HART & HEGEMAN ELECTRIC CO., 103 HAWTHORN ST., HARTFORD 6, CONN., U.S.A.

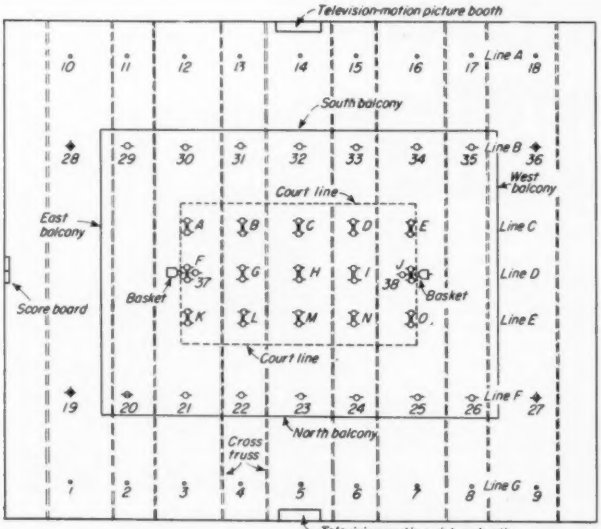
Branches in: BOSTON, CHICAGO, CLEVELAND, CINCINNATI, DALLAS, DENVER, DETROIT, LOS ANGELES, NEW YORK, PHILADELPHIA, PITTSBURGH, SAN FRANCISCO, SYRACUSE. In Canada: ARROW-HART & HEGEMAN (CANADA) LTD., MT. DENNIS, TORONTO.

PRINTED IN U.S.A.

100 FOOTCANDLES of illumination are delivered to the playing floor by 46 high-bay 1500-watt reflectors, mounted 50 feet above the court between roof girders. Balcony for cameras can be noticed above the side-arena seats.

playing floor, provided by deep bowl porcelain enameled reflectors. Raising footcandles from 3 to 100 necessitated a wiring revision, jumping the design watts-per-square-foot from 1 to 20.

As now installed, there are 15 twin high-bay 1000-1500-watt units mounted over the court, two single high-bay 1000-1500-watt units directly over the baskets, 14 single high-bay assemblies between the court lines and balcony edges, four single medium-bay 1000-1500-watt reflectors over the end balconies, and 18 medium-bay 500-watt units above the side balconies. During tournament play, lights over the balconies are not used. Reflectors inside the balcony limits are lamped with



Twin high bay reflector 1,000-1,500 watts
Single high bay reflector 1,000-1,500 watts
Single medium bay reflector 1,000-1500 w
Single medium bay reflector 500 watts
All units mounted with disconnect hangers

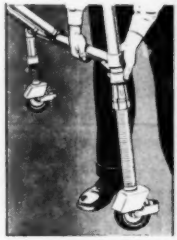
REFLECTORS are in front of the two baskets so that players never have to look directly into a light when taking a shot, and since lamps are mounted above roof girders the spectators in the end balconies are also protected against glare.

"WOULD NOT SELL IT FOR TWICE THE PURCHASE PRICE"

Says Walter G. Kolb, President, Kolb Electric, Washington, D. C., of his first Up-Right Scaffold.

ONLY Mobile Aluminum Alloy **"UP-RIGHT" SCAFFOLDS** have **BUILT-IN LEGS . . . INSTANTLY ADJUSTABLE**

for rapid leveling on uneven floors or on stairways. Eliminates the cost of tedious screw leveling.



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MOBILE TOWER SCAFFOLDS up to 45' or higher assembled in 1 to 15 minutes.

EXCLUSIVE FEATURES
That save time & increase profits

1. Patented one-piece sections — no separate frames. Each section folds flat. No wrenches, wing nuts, bolts or loose parts.
2. Patented casters lock swivel and wheel as one.
3. Welded construction provides greater strength and safety.
4. One man assembly—each aluminum alloy section can be carried and assembled easily and safely by one man.

MOBILE TOWER SCAFFOLDS in desired number of 6' or shorter section units.

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Before buying scaffolds insist on a demonstration—then buy the best—the one and only

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Factories: BERKELEY, CALIF., & TETERBORO, N. J.

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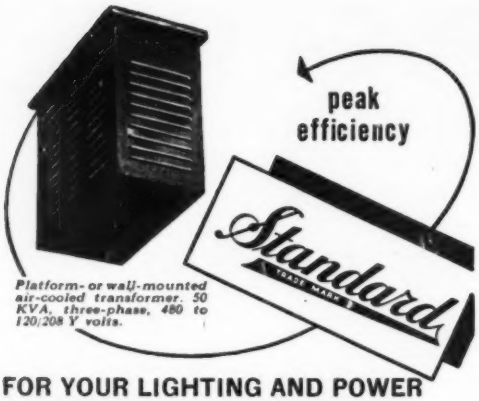

Platform- or wall-mounted air-cooled transformer. 50 KVA, three-phase, 480 to 120/208 Y volts.

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Standard's dry type load center transformers assure correct voltages at point-of-use. Installations are easily made and can be quickly relocated to conform to changing departmental requirements. Consult your Standard representative today. He can show you how Standard transformers save you money by assuring top performance from your equipment.

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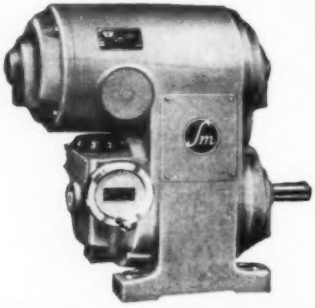
lowers production costs...



with control of speed

STERLING SPEED-TROL
. . . Gives You Variable Speed Control Necessary For:

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- **TIME CONTROL OF:** Baking—drying—heating—cooking—pasteurizing—soaking—chemical action—etc.
- **EQUIPMENT ADAPTATION TO:** Load variation—sequence synchronization. Size—tension—hardness or shape of materials to be processed—machined—conveyed—blended—mixed—etc.
- **VARIATIONS IN:** Quality—quantity—operators' abilities—etc.

Ask for your copy of pictorial bulletin No. C-57, showing Sterling Electric Power Drives Turning The Wheels of Industry

STERLING ELECTRIC MOTORS

Plants: New York 51, N. Y.; Los Angeles 22, California; Hamilton, Canada; Santiago, Chile.
Offices and distributors in all principal cities.

1500-watt bulbs and operated at 10% over voltage. Life lamp is approximately one season. Since all reflectors over the court are located in front of or to the side of the baskets, players are never subjected to direct glare when shooting for a goal. And since all units are mounted above the roof girders (50 feet above the floor), spectators in the end balconies are likewise protected from source brightness of lamps.

When only 55 footcandles are required, the same units are used but reflectors are lamped with 1000-watt bulbs operated at rated voltage. Units, all of which are mounted with Thompson disconnect hangers, are lowered for relamping and maintenance. This secondary illumination level of 55 ft-c is the level normally used, for it provides excellent visibility for players and spectators, plenty of light for television, and adequate light for everything except professional motion pictures where movie frames-per-second are speeded up.

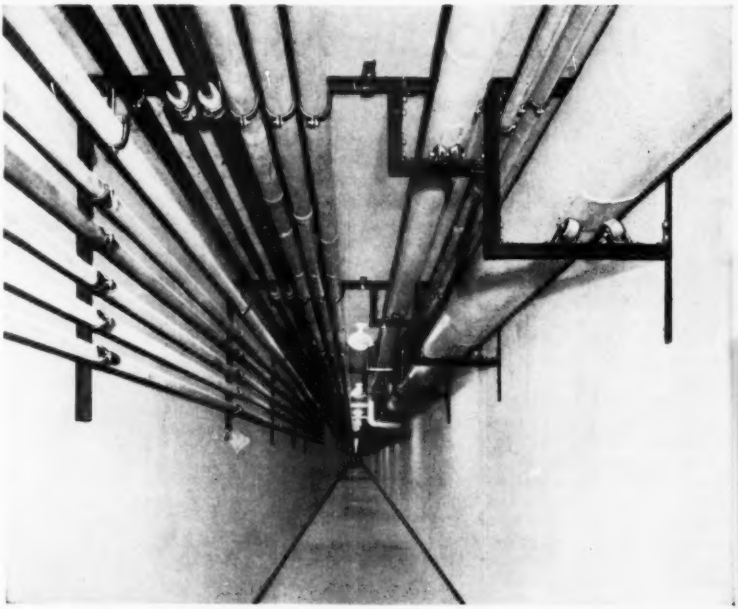
For practice sessions, and for many slower-moving indoor sports, two rows of the twin high-bay 1000-watt units are switched off.

Local conventional lighting is installed over the scoreboard, providing high-intensity illumination for rapid and accurate checking of statistics.

Although the installation can be classified as a pioneering project, results have been praised by players, coaches, spectators and television engineers alike, and several duplicate installations are already planned.

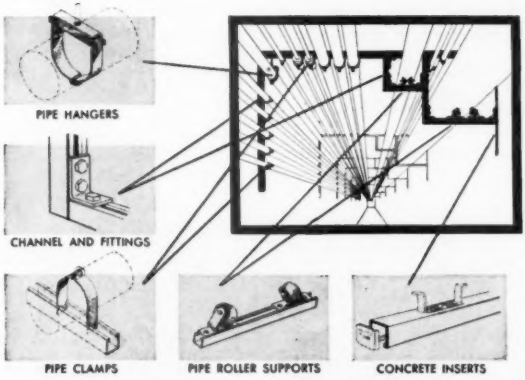
NEW ENGLAND TRIO includes George W. Hilton, field engineer from Underwriters' Laboratories Boston office; P. J. Hicks, Jr., electrical inspector for Providence, R. I., and Fred K. Sullivan, Belmont, Mass., wire inspector at the annual meeting of Eastern Section, International Association of Electrical Inspectors.

UNISTRUT® METAL FRAMING SYSTEM DOES THE ENTIRE JOB* FOR PUBLIC SERVICE COMPANY OF INDIANA, INC.



* Tunnel for all services—electric, steam, water, air and oil lines.

Specifications: Noess & Murphy, Architects—Engineers.
Contractor: Gust K. Newberg Construction Company
Electrical Contractor: Hatfield Electric
Process Piping: Hayes Bros., Inc.



In this large main tunnel installation at Plainfield, Indiana, UNISTRUT channel, concrete inserts, pipe rollers, hangers and clamps support electric, steam, water, air and oil lines—all the services in *one neat package!*

This completely adjustable metal framing system provides a new and more flexible type of mechanical support for every kind of piping, conduit and cable. Assures exact slope or pitch. Permits adjustments, changes or additions to be made at any time. No drilling, no welding, no special tools or equipment. The UNISTRUT method conserves steel, reduces manpower hours, cuts over-all costs.

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For Defense Production—Every day the value of UNISTRUT products is being proved by their use in Defense industries and Armed Services installations where flexibility, assembly and erection speed count most.

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The World's Most Flexible All-Purpose Metal Framing

In The News

IAEI HOLDS ANNUAL MEETINGS

Electrical Inspectors study code problems, new industry developments in five section conferences.

THE 1951 round of electrical inspector conferences began with the three-day meeting of the Southwestern Section, International Association of Electrical Inspectors, at the Hotel Lafayette, Long Beach, Calif., Sept. 13-15. During the succeeding weeks the Northwestern Section met at Spokane, Wash.; Western Section at Omaha, Neb.; Eastern Section at Atlantic City, N. J.; and the Southern Section, which completed the cycle, at Richmond, Va., Oct. 15-17.

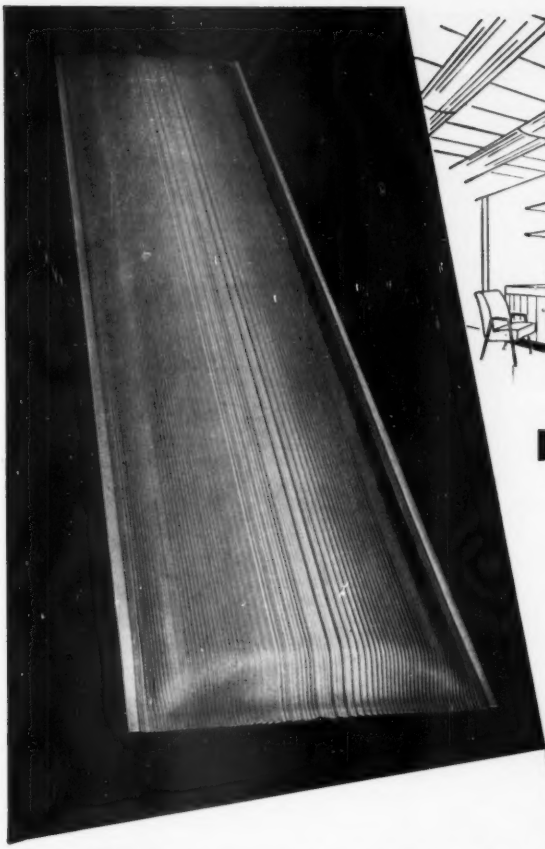
Members from the U. S. and Canada swelled the attendance at all section meetings. During the formal portions of the convention agenda they heard technical presentations by recognized speakers in the electrical industry; listened to Code Panel Reports and discussed recommendations; received committee reports and elected officers. Detailed discussions of Code regulations and interpretations were supplemented by an uninhibited exchange of field problems and solutions to complete the informal part of the session programs.

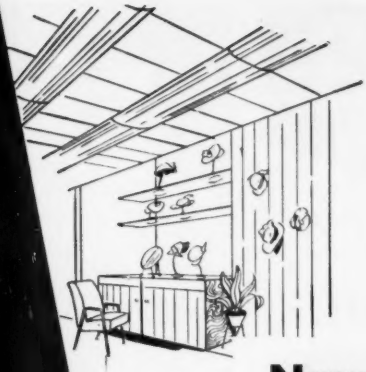
International President, Arthur C. Veit, Los Angeles, urged all sections to increase their membership; asked approval of the Dues Structure Committee's recommendation to up the annual dues of active and associate members; revealed that response to the Type F membership (cities and municipalities) was not as good as anticipated. Only 95 local governmental groups in 12 states hold this type of membership. California tops the list with 75 Type F members, he added. Mr. Veit made a strong plea to decrease the correspondence burden of the International Secretary by handling local matters in local committees. He recommended regular meetings of sections of a committee, if funds are available for such action; urged the continued development of a strong international organization through an enlarged active membership; reminded those present that the success of each individual inspector, and of the association, depends upon the kind of personal service each man renders his community.

Charles L. Smith, international secretary-treasurer, Chicago, outlined the difficulties of operating an organization during the present inflated economy on essentially a pre-war dues structure; advocated acceptance of the new dues proposal which would increase active dues to six dollars; associate to ten; other types the same as at present. A more equitable reapportionment of dues income between chapter, section and the international office would also be made. Smith also suggested that Chapters underwrite expenses of sending their secretaries to section conventions. Expansion of association public relations work was also advocated.

WESTERN SECTION OFFICERS, IAEI, elected at recent conference in Omaha, are: (L to R) C. M. Park, Chicago, second vice-president; J. C. Denner, Saginaw, Mich., first vice-president; H. L. Parks, Charleston, W. Va., president; and F. H. Moore, Indianapolis, secretary-treasurer.

SOUTHWESTERN SECTION, IAEI, official family includes: (L to R) E. V. Muller, immediate past-president, Los Angeles; R. D. Johansen, president, Alameda; A. C. Veit, international president, Los Angeles; H. G. Ufer, secretary-treasurer, Los Angeles; and E. E. Carlton, second vice-president, Burlingame. First vice-president (not in photo) is C. R. Meikel of Bakersfield.





New Corning Lightweight Curved Lens Panel

Fixture-length for More Pleasing Appearance

WATER-WHITE! Corning's "water-white" crystal, developed specially for lighting, transmits the true color of the light source. Full utilization of the longer wave lengths improves color rendition under fluorescent light.

FEATHERLIGHT! You will be truly amazed at the light weight and ease of handling of a four-foot panel of this new lensed enclosure.

SIZES RIGHT! One-piece panels four feet long for individual fixtures and long runs simplify mounting and minimize the number of visible butt joints.

NOT TOO BRIGHT! Control of brightness in the glare zone is achieved by precise treatment of the prismatic details in the side area. Light is refracted out of the glare zones and into directions useful for illumination.

Entirely new in the field of lensed enclosures is the new lightweight *single piece* Curved Lens Panel developed by Corning to complement the clean-lined styling of modern fluorescent fixtures. The pleasing appearance of its fixture-length panels of crystal-clear glass reflects the increasing importance of lighting glassware as an architectural element. The precise optical design in "water-white" crystal is a realization of the need for scientific control over the color and quality of the light produced. Open and closed end panels are available in four standard sizes, and consideration will be given to special lengths and widths. The coupon will give you complete information. Mail it today!

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Technical Products Division: **Laboratory Glassware, Signalware, Glass Pipe, Gauge Glasses, Lightingware, Optical Glass, Glass Components**

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Please send me complete information on new Lightweight Curved Lens Panels.

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Drilling and Cutting in Concrete and Masonry with

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DEPENDABLE

ELECTRIC HAMMERS

Their 3600 powerful blows per minute make short work of drilling anchor bolt holes, in concrete and masonry—cutting and chipping holes in concrete and masonry walls and floors for pipe—scaling rust and residue in tanks and boilers.

They'll pay for themselves time and again on job after job in time and energy saved.

Only One Working Part—THE PISTON!

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#80 Lexington Homer City, Pa.

PIGTAIL SPLICES and how to make them properly is the subject V. G. Mulligan, Ideal Industries, Inc., Sycamore, Ill., carried to electrical inspectors throughout the country as he made the circuit of recent IAEI Section conferences.

Among those appearing at all section conferences were F. E. Hodgdon, chief methods engineer, American Gas Association, Inc., Cleveland, Ohio; and V. G. Mulligan, merchandising manager, Ideal Industries, Inc., Sycamore, Illinois. Hodgdon outlined the activities of the AGA Laboratories in testing gas appliances from the standpoint of structural and performance compliance with American Standard requirements. AGA electrical component parts tests supplement the Underwriters investigations in that appliances are tested under actual operating conditions. Such electrical tests include temperature observations, leakage current and voltage tests. Gas appliances shipped in a "knocked-down" condition must have wiring diagrams showing location and connection of electrical components in accordance with AGA test findings, Hodgdon revealed and asked the electrical inspectors to cooperate by informing AGA of any field problems encountered in gas appliance installation.

Most failures of electrical conductor joints can be traced to improper installation, V. G. Mulligan told the inspector groups. Cold-flow solder joints, unnecessary twisting of conductor ends when using the twist-type ("Wire-nut") connector; improper stretching of plastic impregnated tapes, and failure to "close" the tool on crimp-type connectors all add to the inspectors' woes, he added. Through an illustrated talk, Mulligan presented the "do and don't" of making pig-tail splices and connections; asked the electrical inspector to act as a teacher and trainer when he encounters mechanics who make improper splices. By doing this, the inspector can help all manu-

A *Twist* of the *Wrist* and IT'S LOCKED!

NEW *Turn-Tyte* INTERLOCKING DEVICES *by* RODALE

Got a wire connection problem on industrial equipment? New TURN-TYTE *Cord Connectors, Caps and Receptacles* are your answer!

YOU SAVE TIME!

Slight turn locks them TIGHT!
TURN-TYTE *2-Wire Armored Cord Connector Body.* Two pieces of molded bakelite, with armored base and cord clamp. Bronze contacts coated to resist rust and corrosion. Available in 10-15 amps. (#2100) and 20 amps (#2200).

YOU SAVE MONEY!

...they're fully INTERCHANGEABLE with other makes!
TURN-TYTE *2 Wire Armored Cap* with cord clamp. Bakelite with brass blades. Available in 10-15 amps (#1206) and 20 amps (#1226).

SOLD ONLY THROUGH LEADING WHOLESALERS

If your wholesalers cannot furnish you with TURN-TYTE devices, we will be pleased to send a new catalog and names of suppliers in your area who can fill all your RODALE needs.

Also Available: **3-Wire, Polarized and Grounded. 1-15 Amps and 20 Amps. IMMEDIATE DELIVERY!**

RODALE
MANUFACTURING CO., INC.
EMMAUS PENNSYLVANIA

facturers do a more satisfactory job through better installation and application techniques, he concluded.

Southwestern Section

By W. A. Cyr

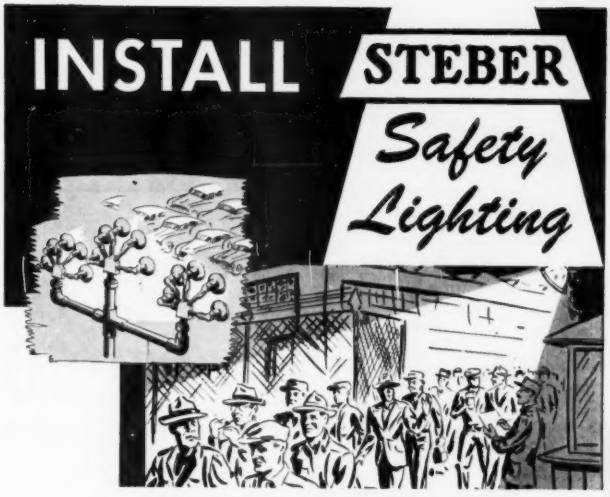
The Southwestern Section, IAEI held its 28th annual meeting at the Hotel Lafayette, Long Beach, California, Sept. 13-15. Section President E. V. Muller, told the group of efforts to achieve uniformity in codes and rules; added that achievement of such uniformity would be difficult until reasons for enacting local rules are clearly understood. While local authorities frequently feel they have no voice in making the NEC, Muller pointed out that members are often unwilling or unable to engage in the extra work that committee participation involves.

In addition to Veit, Smith, Hodgdon and Mulligan who made the circuit of all section meetings, several others addressed this session. W. J. Alcock, Underwriters Laboratories, Inc., Chicago, explained the difference between UL label service and re-examination service plus the limitations and identification of each. R. W. Stange, National Board of Fire Underwriters, San Francisco, pointed up the responsibilities of the electrical inspector and appraised his value to the community.

M. M. Brandon, head of the electrical coordinating committee on the National Electrical Code participated in code panels and discussions; also outlined the procedure for receiving and processing proposed Code changes. J. B. Clapp, General Cable Corp., demonstrated the new MI (mineral insulated) wire; explained how the magnesium oxide insulation will not emit toxic gases when heated and how it will stand up under violent mechanical shock and high heat.

Although there were no exceptionally controversial issues presented at the conference, the section voted to offer for Code processing three important changes and additions:

1. Adoption of the provisions of California's Safety Orders for motion picture studios which are acceptable to the movie industry and have proved safe over long experience.
2. Recommendation for a new Code section with rules for the installation of electric resistance heating in industrial and residential applications. Rules submitted were developed by a committee in the southern California Chapter.
3. Introduction into the Code of a special article covering rules for low-voltage remote control wiring systems. General concensus was that the regulations as now written in the Code were too scattered and vague



FOR ALL FACTORY AND RECREATION AREAS

As more and more plants take on essential production, better safety lighting will be required for entrances, driveways, shipping and receiving zones, storage and parking lots. All Steber lighting units are engineered for economy, ease of installation, high efficiency lumen output, exceptionally long service, and a minimum of maintenance. Write for Steber catalogs today.

Steberlites may be mounted singly or in clusters up to 6.

Steberlites are fully wired, weatherproof units for medium and mogul base reflector lamps. No separate reflectors are needed.

These Steber Lines Meet All Requirements

STEBERLITES

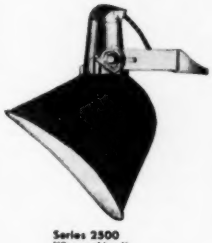
Completely wired, weatherproof, cast aluminum Steberlites are ideal for the protection of vital industrial property and employees. They can be quickly and easily installed in literally hundreds of combinations to supply ample light where needed. Steberlites for Par-38 and R-40 spot and flood lamps can be mounted on poles, walls, outlet boxes, or directly to "T" conduit bodies. Write for Bulletin 120-51.

STEBER FLOODLIGHTS

Steber lighting units are available in open or enclosed types, 100 to 1500 watt sizes. All models are fully wired and fitted with versatile mounting brackets. Write for Bulletin 127-50 and 128-50 for complete information.

NEW "SPACE-LITER"

This new open type elliptical floodlight is scientifically designed and ruggedly built for the economical lighting of large areas. Uses General Service Lamps—300-1500 watts, Bi-Post Lamps—750-1000 watts, or Mercury Vapor Lamps—400 watts. Available with or without Alzak auxiliary reflector. Write for Advance Data Sheet 1051.



Series 2500 "Space-Liter"

STEBER LIGHTING UNITS

STEBER MANUFACTURING COMPANY

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SAVE CASH—CALL A SYLVANIA COP

That's right, Sylvania COP (Cut-Out Premium) starters save money by cutting out flashing tubes which can damage ballasts, waste current.

Your customers will be glad to know about this dollar-saving, time-saving item. Insist they guard every fluorescent circuit with Sylvania COP starters. For full information address: Sylvania Electric Products Inc., Dept. L-6411, 1740 Broadway, New York 19, N. Y.

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FLUORESCENT TUBES, FIXTURES, SIGN TUBING, WIRING DEVICES; LIGHT BULBS; RADIO TUBES; TELEVISION PICTURE TUBES; ELECTRONIC PRODUCTS; ELECTRONIC TEST EQUIPMENT, PHOTOLAMPS; TELEVISION SETS

Prevent Costly Burnouts with VAP-OIL-TITE FITTINGS

Fouled contacts cause costly burnouts and down-time. Use VAP-OIL-TITE FITTINGS with Plastic Covered Flexible Metallic Conduit for Sure Sealing of wiring on oil, water, dust and vapor tite equipment.

VAP-OIL-TITE'S exclusive threaded bushing not only insures positive grounding but also makes fitting easier to install because a collar covers metal edges making burring unnecessary. Furnished in numerous types with body sizes from 3/8" to 2". Write or wire today for bulletin #MT-104 giving types, sizes and prices.

SIMPLET ELECTRIC COMPANY
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D. W. JUST, assistant secretary, Underwriters Laboratories, Chicago, tells electrical inspectors assembled at Omaha that the degree of electrical equipment grounding protection depends upon the reliability of the method used.

on many of the questions which arise on the subject.

For the third time, the Southwestern Section reiterated its former request that Article 240 be changed to require overcurrent protective devices (fuses and circuit breakers) to clear a circuit instantly to prevent excessive burning and arcing at the fault point. Specifically, it asked that all 15- and 20-amp. devices in dwelling occupancies be of the time-delay type which would clear the circuit instantaneously on any current over 100 amperes; the same rule to apply to ranges, heating devices and other noninductive loads. Added this year was a request that the Code require circuit breakers on 15- and 20-amp. circuits in dwellings be non-interchangeable with breakers of higher ratings.

Northwestern Section

Dominating the program of the 25th annual meeting of the Northwestern Section at Spokane, Sept. 19-21, was a thorough review of NEC articles with a view to uncovering needed revisions. Code panel discussions took a portion of each day's agenda; rated equal billing with addresses and prepared talks by various industry leaders.

L. B. Garff, Northwestern Section president, paid high tribute to the Section's efforts to safeguard users of electrical energy in the Northwest area against fire and accident hazards through diligent administration of electrical laws and ordinances. Indications of the Section's importance and growth were given when secretary-treasurer, W. L. Gaffney reported a gain of 90 members during the year.

Thomas W. Delzell, Portland General Electric Co., commended the teamwork of the manufacturer, contractor, dealer, utility and electrical inspector

in bringing safe, dependable power to customers who are constantly demanding more and more power in their homes, commercial and industrial establishments.

Although bus duct has been on the market for 20 years, it has made its greatest gains in popularity since the war, stated T. E. Ashley, Westinghouse Electric Corporation. He explained the design and application of principal types to commercial buildings, industrial plants, hospitals and schools and prophesized increased use for industrial applications in the future.

Western Section

By August Eckel

More than 400 members and guests at the Western Section Omaha meeting heard Faye Smith, general manager, Omaha Public Power District, open their 47th annual conference. Smith told the inspectors to take the lead in seeing that new safe and economical methods are made available to the public; expressed regret that completion of polarized wiring through to the attachment plug was not adapted prior to the post-war building boom.

The degree of protection afforded by appliance grounding depends upon the reliability of the method used, stated D. W. Just, assistant secretary, Underwriters' Laboratories, Chicago. Lack of automatic grounding means keeps appliance grounding an unsolved problem, he pointed out while reviewing the various techniques employed over the past years.

S. J. Rosch, consulting cable engineer, Anaconda Wire and Cable Co., Hastings, N. Y., ventured a look into the future of wiring installations. What he saw: A 50 percent increase in use of electricity within the next decade even in the poorest home; acceptance of 7,500 volts as a national standard of distribution voltage; eventual use of high frequency circuits even in the home.

Returning to the realm of present day developments, Rosch discussed the role of Polyethylene as a cable insulation. This material, which has some of the most remarkable properties ever found in an insulation, when combined with a PVC (polyvinyl chloride) jacket provides a conductor insulation which is flame retarding and immune to practically everything but gophers, Rosch asserted, noting that new electrical cables must be developed to keep abreast of modern developments.

Henry M. Dreher, engineering and safety regulations department, NEMA, New York, labeled erroneous any impressions that NEMA is opposed to use of wiring larger than minimum

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RELAXING ENROUTE to Omaha on board the Western Section, IAEI special train are Jesse Fivecoat (left), city electrical inspector of Kokomo, Indiana, and George H. Martzolf, oldest established electrical contractor in that city.

requirements. Offering as evidence, the support of the Adequate Wiring Program, Dreher reiterated NEMA's philosophy that *only safety provisions should be legislated and adequacy and convenience in electrical installations should be sold.*

By means of an illustrated talk, J. C. Langaunet, manager, bus duct section, standard control division, Westinghouse Electric Corp., Beaver, Pa., showed the inspectors how bus duct is answering the problem of higher current distribution requirements in today's industrial and commercial building electrical systems.

At the open forum sessions, discussions on code rules and inspectors' problems were numerous and varied. Again, the advisability of eliminating concentric knockouts in switch and panel boxes was voiced. Some members, like those of the Northwestern Section, want a single Type RHW cable with a universal 75 degree C rating. This is to replace the present dual labeled RH and RW cable which carries different temperature ratings when used in hot or damp locations.

Many western section members believe that the NFPA Pamphlet No. 56 covering rules on hospital operating room installations should be added as an appendix to the NEC rather than be available in separate form. A proposal for recognition of moisture and corrosion-resistant type non-metallic sheathed cable in the Code was presented and referred to the proper Code Panel.

Fred Adam, president of Frank Adam Electric Co., suggested a clarification of Section 3882 on overcurrent protection of panelboards with snap-action switches. The acceptance

and recognition of the new M. I. conductor (mineral insulated) in certain divisions of Class I, II, and III locations was referred to the proper Panel for consideration. There was a question as to whether the terminal connectors would be adequate in such applications.

The conference approved a proposal to identify cartridge fuses by printing the data on the cartridge instead of the pasted label now required; also confirmed action by other sections in eliminating the requirement that inspectors judge the availability of dual-element fuses for motor protection.

Western Section honorary membership status was conferred upon Wm. A. Stacey, McKinley-Mockenhaupt Co., Chicago; and Clifford Anderson, Oklahoma City. Fred P. Oliver, co-chairman, IAEI membership committee, urged all chapters to start a membership drive; cited the Kentucky Chapter for bringing in 78 new applications so far this year.

Eastern Section

By H. P. Scott

The Eastern Section of the IAEI held its 27th annual meeting at the Hotel Claridge, Atlantic City, N. J., October 1st, 2nd and 3rd, with over 350 members and friends attending the crowded 3-day program of addresses, open forums, committee reports, elections and social events. In terms of speeches, delegate participation, manufacturers' exhibits, hotel facilities, attendance, committee activity and entertainment, the convention merited high commendation.

Officially opened by J. D. Lynett, chairman of the Annual Meeting Committee and past president of both the IAEI and the Eastern Section, the first

DEEP CONCERN OVER proper grounding of TV antennae is expressed by: (L to R) C. W. Farwell, Omaha Public Power District; chief electrical inspector J. E. Fisher of Elkhart, Indiana; and A. C. Morton, Farmers Mutual Insurance Co., Lincoln, Neb. at recent IAEI sectional meeting in Omaha.

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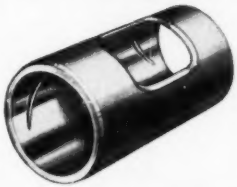

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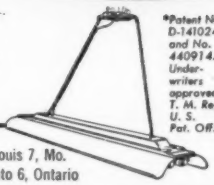

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BIG THREE at IAEI Eastern Section's 27th annual meeting at Atlantic City, N. J., were Art Veit of Los Angeles, international president of the Association; B. F. Greene of New York City, retiring president of the Eastern Section, and J. D. Lynett of N. Y. C., chairman of the Annual Meeting Committee and past president of both the Eastern and International groups.

day's program included addresses by M. M. Brandon, chairman of the NFPA electrical section and v. p. of Underwriters Laboratories; James W. Carpenter, v. p. of the Long Island Lighting Co., and past president of the N. Y. Electrical and Gas Association; W. T. Stuart, editor of *Electrical Construction & Maintenance;* H. H. Watson, General Electric Co., chairman of Code-Making Panel 2; B. F. Greene, president of the Eastern Section and administrative assistant, Department of Water Supply, Gas & Electricity, City of N. Y., and Arthur C. Veit, president of the IAEI.

Brandon, discussing the theory back of the Code's formation, outlined the requisites of a good Code panel chairman and committee, and explained the routine through which a Code suggestion passes before it is either accepted or abandoned.

J. W. Carpenter's topic was "The Toughest Task in Town," and he stated that it was not the securing of material allocations, not the correct interpretation of the Code, not the vocations of teaching or medicine, but convincing fellow Americans to understand, act, feel and speak like Americans.

Bill Stuart, speaking of "New Frontiers for Electrical Progress," stressed that we are witnessing a constant evolution of electrical design, methods and techniques. "Just within the past decade," he said, "we have seen the development of fluorescent lighting, unit substations, high-voltage distribution, radiant heating, modular switchgear, synthetic insulations, electronic control and many other trends."

H. H. Watson's talk on "Appliance Branch Circuits" launched an interesting floor discussion on the wisdom for increasing residential design loads to 3 watts per sq. ft.; the installation of 2 or more appliance circuits in the kitchen; making the use of Number 12 wire mandatory, and the use of 220-volt circuits for appliances.

Features of the second day's program included addresses by R. H. Fries, associate electrical engineer for Underwriters' Laboratories; P. C. Jacobs, Jr., representing the Chase Shawmut Co.; V. C. Mulligan of Ideal Industries; S. J. Rosch, consulting cable engineer for Anaconda Wire and Cable Co.; the Hon. Dominick E. Paduano, Commissioner of N. Y. C.'s Department of Water Supply, Gas & Electricity; J. L. Wagoner from Westinghouse, and S. N. Buchanan.

Both Mulligan and Buchanan discussed wire splicing, illustrating their analyses with examples of accepted practice in making connections by the solder and tape, wire nut, set screw, crimping and nylon cap methods.

Using an effective machine mock-up to show the function of various types of relays and starters, Wagoner spoke on "Low Voltage Protection," while Jacobs interestingly presented the characteristics, advantages and operation of "Amp-Traps."

Sam Rosch's subject was "Trends Today and Tomorrow" and, in his usual dramatic manner, he discussed the acceptance of aluminum wire, the possibility of magnesium cable, the development of insulations such as polyethylene, PVC, Butyl and oxide powders, various methods for applying insulation to wire and the utilization of frequencies far above those in general acceptance at the present.

Two addresses were highlights of the third day; a discussion of gas appliance standards by F. E. Hodgdon, chief methods engineer for the American Gas Association, and an analysis

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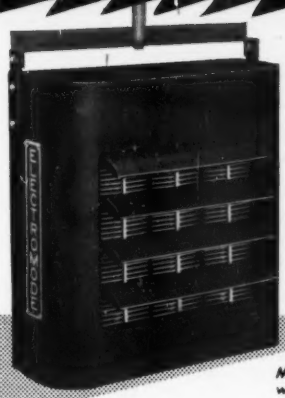

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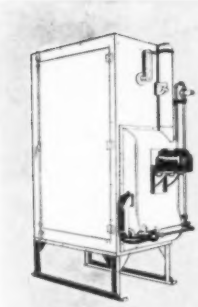

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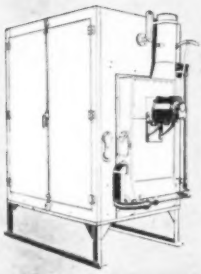

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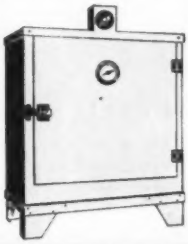

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CONSOLIDATED in thoughts and in association were L. W. McCullough, Walter H. Newton and Albert F. Dettner, all inspectors for the Consolidated Edison Company of New York.

of television and FM antennas by Charles L. Smith, secretary-treasurer of the IAEI.

As usual, Code forums—both at breakfast and as scheduled features of the business sessions—prompted enthusiastic participation by inspectors, contractors, manufacturers and utility representatives. And, also as usual, the range of subjects was wide, running from switch ratings and causes for the overheating of panels to the breakage of bakelite receptacles, the number of wires permitted in conduits of 120-volt alarm systems, concentric knock-outs in switchgear and grounding of system components.

Southern Section

By B. C. Cooper

The Southern Section convened in Richmond, Va., for its 23rd annual meeting, held October 15-17. Over three hundred delegates and guests attended this three day affair. An added feature was the first annual electrical industrial exhibition of the Electrical Manufacturers Representatives of Virginia, sponsored jointly by the Southern Section and the EMROVA group.

This meeting was called to order by Southern Section President Woodrow W. Fowler, chief electrical inspector of Columbia, S. C., who was introduced by J. L. Speights, general chairman of the Richmond Arrangements Committee. After invocation by the Virginia Chapter Chaplain, President Fowler introduced Honorable T. Nelson Parker, Mayor of the City of Richmond, who cordially welcomed the inspectors and their guests to the Virginia city. Response was made by D. L. Johnson, Executive Council representative and Superintendent of Electrical Affairs, Atlanta, Ga.

W. W. Fowler next gave his Presidential Address, in which he stressed the need to educate the public to re-

spect the Code and the principles for which it stands. These he defined as protections for health, safety, and security for the community.

Robert A. Peterson, technical assistant secretary, was next introduced by Mr. Smith. He reported on his activities during the past year, especially as regarded his field trips, including attendance at Section meetings and a number of Chapter meetings.

F. P. Oliver, chairman of the IAEI Membership Committee, reported on membership activities, and urged solicitation of membership from more electrical contractors and inspectors in the larger centers, as well as of inspectors in the smaller cities and municipalities.

A. M. Miller, Richmond inspector and secretary-treasurer of the Southern Section, reported on membership and financial status for the Section.

C. V. Porbes, Underwriters Labs., Inc., New Orleans, reported as chairman of the Executive Committee that the 1952 Southern Section 24th annual meeting will be held in Nashville, Tenn., on October 13-15, and that the 1953 25th annual meeting will be held in Chicago, Ill., September 21-26.

Other principal speakers during the three-day conference included Percy Bugbee, general manager of NFPA, Boston; F. E. Hodgdon, American Gas Association, Cleveland; V. G. Mulligan, Ideal Industries, Sycamore, Ill.; Thomas P. Branch, engineer, REA, Washington, D. C.; and G. M. Kintz, supervising engineer, U. S. Bureau of Mines, Dallas, Texas.

Mr. Bugbee discussed "Cooperative Efforts of NFPA and the IAFI." He outlined the history of NFPA since it was organized 56 years ago, and stated it now operates in 50 countries, plus the United States and Canada. It is essentially a clearing house on information for fire prevention and control, he said, and distributes from seven to ten million pieces of literature annually. He further outlined how NFPA operates in its sponsorship of the National Electrical Code, and how the Code Committee functions.

G. M. Kintz presented some unusual demonstrations of "Hazards in Explosive Atmospheres." Using clear hard glass tubes, he set off explosions within the tubes in a darkened room to show visibly what takes place when an explosion occurs as, for example, in an explosionproof lighting unit. Various means of gasketing were demonstrated, and other simulated conditions as found in industry were set up and shown.

Reports of Code Panel Committees and code discussions jammed the remainder of the three day program. Inspectors and electrical contractors and others related experiences regarding the many topics brought up for discus-

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sion, and expressed opinions based on their experiences quite freely, contributing to some very lively sessions. A code breakfast session was devoted principally to a discussion of "Special Appliance Branch Circuits."

New Officers

At the business sessions of the section meetings, new officers were elected for the 1951-1952 term as follows:

Southwestern Section, President—R. F. Johansen, Almeda; first vice-president—C. R. Meikel, Bakersfield; second vice-president—E. E. Carlton, Burlingame; secretary-treasurer—H. G. Ufer, Los Angeles.

Northwestern Section, President—Chris Klawa, Portland, Oregon; first vice-president—Rankin C. Young, Boise, Idaho; second vice-president—John R. Crawford, Butte, Montana; secretary-treasurer—W. L. Gaffney, Tacoma, Washington.

Western Section, President—H. L. Parks, Charleston, W. Va.; first vice-president—J. C. Denner, Saginaw, Mich.; second vice-president—C. M. Park, Chicago, Ill.; secretary-treasurer—F. H. Moore, Indianapolis, Indiana.

Eastern Section, President—Frank Stetka, Washington, D. C.; first vice-president—Martin G. O'Rourke, Waterbury, Conn.; second vice-president—Fred L. Mattfield, Long Island, N. Y.; treasurer—Allen W. Hopkins, Springfield, Mass.; secretary—F. N. M. Squires, N. Y. C.; ass't. secretary—John W. King, Providence, R. I.

Southern Section, President—Russell A. Miller, Tampa, Florida; first vice-president—Robert E. Ward, Kenton, Tennessee; second vice-president—Joseph Snakenberg, New Orleans; secretary-treasurer—A. M. Miller, Richmond, Virginia; ass't. secretary—Conrad V. Porbes, New Orleans.

SELECTING A SLATE OF new Western Section, IAEI officers are (L to R) A. H. Welklin, Ft. Wayne, Ind.; R. C. Loughead, Detroit, Mich.; and D. J. Talbot, Chicago, Ill. Result: Their choice unanimously elected.

Maintenance Workshop in Rochester

The first Electrical Maintenance Workshop for Industry in Rochester, New York, was conducted October 3rd and 4th under the auspices of the Electrical Association of Rochester. The Workshop included a series of conference panels held concurrently with a trade show.

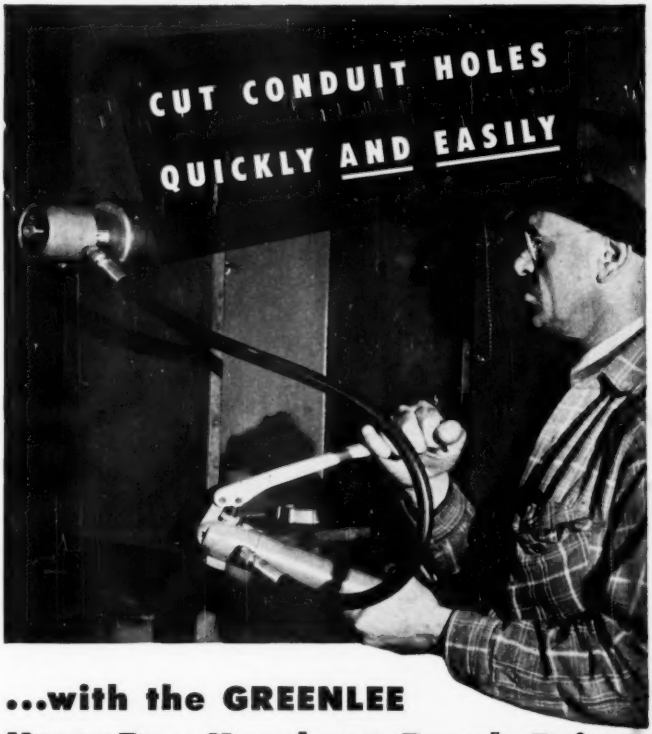
Conferences opened with an address by J. W. St. Andre, electrical editor of *Factory Management & Maintenance*, who emphasized the importance of electrical maintenance personnel training for the growing complexity of industrial electrical apparatus. He urged more attention by design engineers to electrical maintenance problems.

The first panel was under the direction of J. A. Gienger, electrical engineering consultant, Eastman Kodak Co. On the panel were: G. E. Saunderson, district application engineer, Westinghouse Electric Corp., who discussed maintenance of panel boards and safety switches; D. Pettit, industrial control specialist, Square D Co., whose subject was maintenance of motor control; R. F. Waldo, division manager, Ideal Industries, Inc., who discussed maintenance of rotating machinery; and Mr. J. C. Andreas, Louis Allis Co., who talked on maintenance of motors.

The second panel conducted by F. G. Kirkham, ass't. director of Facilities, Eastman Kodak Camera Works, included a talk on preventive maintenance by H. R. Meyer, manager of maintenance sales dept., Westinghouse Electric Corp.; the economics of electrical safety by A. L. Cobb, safety director, Eastman Kodak Co.; and electric maintenance, its concern to management, by J. W. St. Andre. The closing conference was conducted by E. B. Kempster, Jr., Rochester Products Division, General Motors Corp. His panel consisted of W. S. Fisher, industrial lighting specialist, General Electric Lamp Co., who talked on the maintenance of lighting installations; J. R. Petree, ass't chief engineer, Crouse-Hinds Co., who discussed electrical maintenance in hazardous locations; L. E. Edwards, eastern division mgr., Bussman Mfg. Co., who talked about protective maintenance with fuses; R. B. McKinley, mgr. commercial engineering, General Electric Co., who spoke on wires and cables.

At the windup dinner, W. T. Stuart, editor of *Electrical Construction & Maintenance*, urged consideration of electrical maintenance cost in the larger framework of production operations and called upon electrical maintenance engineers to seek out expert counsel and help from electrical industry resources that are available to them.

Twenty-eight exhibitors displayed a



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Here's the simplified, *extra-efficient* way to enlarge knock-outs, or cut entirely new openings, for conduit up to 4". Speed jobs, save labor with the powerful, portable HYDRARAM for GREENLEE Knockout Punches. Develops over 11 tons hydraulic pressure to drive punches through 10-gauge metal in a jiffy! Operation is simple, swift. HYDRARAM set includes Hand Hydraulic Pump, High-Pressure Hose and Ram . . . everything complete for driving GREENLEE Knockout Punches to make ½" to 4" conduit holes and handle all GREENLEE Radio Chassis Punches using ⅜" diameter drive screws. HYDRARAM set is packed in handy metal carrying case. Set may be purchased with or without punches. Get complete details today. Write Greenlee Tool Co., 1751 Columbia Ave., Rockford, Illinois.

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Hydraulic Conduit and Pipe Benders • Hand Benders • Joist Borers • Cable Pullers • And Many Other

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ON CARE AND REPAIR OF PLIERS

SIMPLE REPAIRS CAN SAVE PRECIOUS STEEL!

High quality, forged tools have built-in stamina that makes repairs worthwhile after long, hard usage.

The above free booklet, complete with simple diagrams and easy-to-follow instructions, has been prepared to make repairing easier. It is valuable to the individual pliers user; it is important to the organization with large quantities of pliers.

Single copies are available upon request and we'll be glad to furnish them in quantity for training programs or group use.

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The name UTICA on the pliers and adjustable wrench you use means you're working with the finest in drop forged tools. Drop forging aligns the steel fibre structure with the shape of the tool, as shown in diagram. Drop forging means *extra* strength, *extra* toughness.

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DROP FORGE AND TOOL
UTICA 4 CORPORATION NEW YORK

IT PAYS TO USE QUALITY TOOLS
AND THE WORLD'S BEST TOOLS ARE MADE IN U.S.A.

MANAGING DIRECTOR of the Nebraska-Iowa Electrical Council, Don E. Rosenthal, doubled in brass as general convention chairman and host to more than 400 electrical inspectors at recent Omaha conference.

large variety of industrial electric apparatus and components. The workshop committee for the Electrical Association consisted of Eric Hall of Westinghouse as General Chairman; Homer Locke of Kovelsky-Carr in charge of exhibits; Syd Alling of the Rochester Gas and Electric Corp. in charge of publicity and Bill Bennett of General Electric Supply attendance. Jack Whitford of Requa Electrical Supply Co. developed the program, and Ed Kramer coordinated for the Electrical Association.

Contractors IAC Formed

The National Production Authority has established an Electrical Contractors Industry Advisory Committee. Sponsored by NPA's Lighting and Interior Distribution Branch, Electrical Equipment Division, this committee will function in an advisory capacity, reporting to NPA on industry problems generally, including the demand and supply situation for materials and components needed to provide industrial and building expansion with adequate electrical systems.

Since the electrical contracting industry is not a producer of goods under NPA's Controlled Material Plan, generally speaking, this committee will in effect implement the work of other NPA industry advisory groups from the electrical manufacturing industry. Contractors are users of CMP Class B products made by electrical manufacturers who are allocated their materials under CMP who in general come under the jurisdiction of the Electrical Equipment Division.

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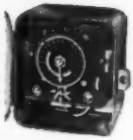
UTILITY TIME SWITCH

When selecting automatic time switches for indoor and outdoor uses remember the advantages of dependable TORK CLOCKS. Ideal for — Signs and Window Lights — Pumping — Defrosting — Oil Burners — Pre-heating — Lead or Wax — Hen house lights. Write today for complete details.



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. . . FOR MAKING LASTING SPLICES

...users who KNOW buy only the BEST

Ask for them by name...
OKONITE and MANSON tapes

First meeting of the Electrical Contractors IAC was held in Washington, D. C. on October 10 and 11. Col. L. Alan Sharp of the Electrical Equipment Division presided.

The number of building wire and cable types should be reduced as an emergency measure, to conserve scarce copper, the contractors recommended after learning of the critical situation regarding copper from NPA spokesmen for the Copper Division. Warehouses generally stock many types and sizes of insulated copper wire to give customers a wide choice, they explained. Elimination of some sizes of wire and cable and some types of insulation would reduce the tonnage of copper in warehouses, they said.

Simplification of design and types of electrical equipment for construction was also recommended by the committee as another conservation measure.

Industry spokesmen stressed that conservation should begin at the design level when construction is being planned. Closer correlation between mechanical and architectural design of construction would make this possible, they agreed.

A forecast of increased defense and essential industrial construction during the first and second quarters of 1952 was made by NPA officials. They emphasized that this increase will further reduce the availability of critical materials, particularly copper, for non-defense building.

Industry members who attended this first meeting were: Walter J. Barnes, Walter J. Barnes Co., New Orleans, La.; C. W. Moseley, R. H. Bouligny Co., Charlotte, N. C.; C. Ray Davisson, Brooker Electric Co., Inc., Detroit, Mich.; C. K. Bryant, Bryant Electric Co., Gastonia, N. C.; Paul Jussel, Jussel Electric Co., Denver, Colo.; C. A. Langlais, Charles A. Langlais Co., San Francisco, Calif.; Richard Osborn, Osborn Electric Co.; St. Louis, Mo.; J. J. Reddington, J. J. Reddington Electric Service Co., Boston, Mass.; W. G. Hoffman, Tennessee Armature & Electric Co., Inc., Knoxville, Tenn.; and L. J. Witt, Youngstown, Ohio.

NISA News

New York Metropolitan Chapter initiated "Get Acquainted With One Another Program" by making planned trip to shops of its members.

On September 18th the following members visited the New Jersey shops of Standard Electric Motor Repair Company, Linden; Reliance Electric Company, Perth Amboy and Lockwood's Electric Motor Service, Trenton:

Another new McGill product with the many quality extras associated with LEVOLIER Switches for over thirty years. Applying this proven mechanism to a socket eliminates costly socket replacements in rugged industrial service. Rated at 660 Watts 250 volts the LEVOLIER No. 4100 has 1/8" cap. 4102—PENDANT. 4103—3/8" cap. Brushed brass finish. Underwriters' Laboratories Inspected.

...leads on 4 points

1 HEAVIER SCREW SHELL
Heavily constructed throughout with bronze screw shell .006 heavier than standard — for added strength at the lamp base. Extra thick fibre insulating liner.

2 USES LEVOLIER SWITCH
Dependable rotary action—universal lever operated with pull from any direction. Convenient terminals.

3 DOUBLE WALL THICKNESS
Cap and casing overlay resulting in double wall thickness over the mechanism — provides added support for the lever.

4 CAP AND CASING LOCK
Threaded collar that locks cap and casing together — prevents separation with actuating pull. Cannot slip over shade threads.

MODEL 25
6 amp "T" rated — 125 volt; 3 amp — 250 volt. Toggle switch.

MODEL 71
6 amp "T" rated — 125 volt; 3 amp — 250 volt. 15/32" thick.

MODEL 41
6 amp "T" rated — 125 volt; 3 amp — 250 volt.

MODEL 1010
10 amp "T" rated — 125 volt; 5 amp — 250 volt.

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For New Catalog No. 49 Write: McGill Manufacturing Co., Inc., 450 N. Campbell St., Valparaiso, Ind.

McGILL® electrical specialties

ONLY McGILL MAKES Levolier SWITCHES

ONE for the money!

"One for the money" is right! Next time you're bargain-hunting for quality wiring installation equipment, you'll find it pays extra sales and profits dividends to specify KEYSTONE Flangeless Screw-cover WireWays and Auxiliary Fittings. They're quality-built through and through . . . yet they're designed to permit quick, easy, economical installation of wiring for meter boards, service boards, loadside switches, etc.

Available in three sizes . . . 4" x 4", 4" x 6", and 6" x 6" . . . and in foot-lengths of 1' through 5' inclusive. Furnished in a variety of knockouts ranging from ½" to 1¼" equally spaced every 3" for making ample connections without costly drilling. Flangeless type 90° elbow and T fittings also available for added flexibility in meeting wiring lay-out requirements. Write for Keystone's "Value-Packed" Catalog today!

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23328 Sherwood Ave. • Centerline (Detroit) Mich.
Sold Through Leading Electrical Wholesalers Coast-to-Coast

A NEW INSULATION TESTER
IN NON-BREAKABLE TEAKWOOD CASE
A SMALL SIZE, LIGHT WEIGHT INSTRUMENT AT A LOW PRICE
- BUT WITH LONG SCALE AS IN LARGE SIZE INSTRUMENTS

New **"MAJOR" MEGOHMER**

WITH 500 VOLT CONSTANT PRESSURE DC GENERATOR
RANGE: 0-50 MEGOHMS WITH EXTRA OHM SCALE
0-10,000 ohms or 0-30 ohms. Size 7½" x 4" x 4". Weight: 4 lbs. 14 ozs. Furnished with solid leather carrying case and 12 ft. test leads. True ohmmeter movement independent of generator voltage.
A REMARKABLE INSTRUMENT AT A REMARKABLE PRICE

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WHY GET UPSET WHEN MOTORS BREAK DOWN?
We give you immediate delivery and rock-bottom prices on

ELECTRIC-MOTOR PARTS

for Brown & Brockmeyer • Delco • Jack & Heintz • Leland • Marathon • Redmond Sunlight • Wagner • Westinghouse—motors

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Write for Catalog—on your letterhead—to

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1728 S. Michigan Ave. Chicago, Illinois
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Milton Volcker, Walter Leirer, Nestor Palohnuk, Edward Everts, William Kauppert, Nat Burlon, Harold Cotter, Robert McKeown, Gene Brown, John Elliott, Walter Prise, Matthew Malinowski, Ted Kyak, Stanley Bojak and G. Lockwood.

Trip was enjoyed by all and chapter intends to continue developing this idea of exchange of information.

•

On September 15th, Mid-South Chapter assembled in Knoxville, Tenn. Thirty members were present on a trip through the reduction plant of the American Zink Company, which proved to be of great interest. Following lunch, talks were delivered by President Zack on Association Finance and by George Brown of IWI on the copper situation.

•

Quaker City Chapter held meeting on September 12th. After dinner and business were cleared up, Howard Davies presented paper outlining ways and means for possible conservation of copper. Bill Engel, Ralph Kufen, Sam Augustine and others participated in lively discussions on this important topic.

•

Award Committee of NISA headed by T. M. Russell made announcement of its latest contest. Fourteen prizes will be given amounting to $350.00. Entries must pertain to the electrical repair industry, accompanied by print, sketch or blueprint and participation open to all employees of member shops.

•

Los Angeles Chapter of NISA held meeting on October 9th at Rodger Young Auditorium. Speaker John Parker delivered talk on subject of collecting account, creating good will and keeping customers. This chapter has no usual summer vacations and previous meeting was held at the same place on August 7th.

•

Niagara Chapter, Buffalo, New York, held meetings on June 11th and September 11th. First meeting was planned especially for the shop workers and management representatives, 36 electricians, foremen and owners were present.

•

Fred Frosdick of Dynamo & Motor Exchange, Inc. demonstrated tools developed for cutting stator coils and for quick calculating of turns in winding coils. Frank Martin Jr. gave a short

talk on NISA membership; Clarence J. Hayes read a paper on "Quality Control of Motor Repair"; and a movie loaned by the Penn Electric Motor Company of Philadelphia was shown.

•

At the meeting in September, George Trieber of Dolph Company led a very interesting informal discussion on baking varnishes and liquid stripping materials, which was appreciated by all.

Walter J. Prise, The Maintenance Company, Inc., New York, N. Y.

Electri Show Held in Pittsburgh

The third annual Industrial Electric Exposition was held in Pittsburgh, Pa. on October 9-11, at the Hotel William Penn. Sponsored by the Electric League of Western Pennsylvania, it attracted a total attendance of nearly 1500 industrial plant men, contractors, maintenance engineers, architects, utility men, engineering students and others from the Pennsylvania-Ohio-West Virgina tri-state area.

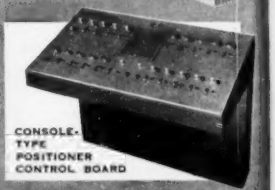
Theme for this three-day exposition was "Electricity—Key to Industrial Production." The program included industry talks by eight authorities on various timely topics and 34 outstanding exhibits and displays, provided by national and local manufacturers and distributors of industrial electrical equipment.

The conference got under way with a kick-off luncheon at which T. O. Armstrong, director of plant labor relations for Westinghouse Electric

COMMITTEEMEN for the 3rd annual Industrial Electric Exposition held in Pittsburgh October 9-11 included Carl J. Long, consulting engineer, general chairman; Fred F. Dickman, West Pennsylvania Power Co., Attendance Committee chairman; and J. W. Onan, Duquesne Light Co., Program Committee chairman. Nearly 1500 visitors registered for the 3-day affair.

SHAW High School
Cleveland, Ohio

MOTOR-DRIVEN POWERSTAT DIMMERS



CONSOLE-TYPE POSITIONER CONTROL BOARD

THE **LUXTROL** SYSTEM *of lighting control* FOR ASSEMBLY HALLS

MINIATURE DIMMER STATIONS CONTROL HIGH WATTAGE LOADS

In assembly halls everywhere — in schools like Cleveland's Shaw High School shown above, and in churches, theatres and organizations of all kinds where people gather — the LUXTROL System of lighting control offers the ultimate in light dimming equipment. The LUXTROL System consists of one or more miniature positioner stations controlling one or more motor-driven POWERSTAT Dimmers. Lights can be dimmed, brightened and blended from conveniently located selector stations with the motor-driven POWERSTAT Dimmers installed in any out-of-the-way area saving valuable space. The compactness of the positioning device allows console-type operation as employed in the Shaw High School. A complete switchboard, with mastering and grand-mastering arrangements, can be mounted in a small cabinet or table — with all controls accessible to the operator. It is, in effect, a large interlocking switchboard in miniature. Complete programs can be set in advance and, at set time intervals, switches actuated to concur with performances.

SEND FOR BULLETIN D951L ON THE LUXTROL SYSTEM OF LIGHTING CONTROL

THE **SUPERIOR ELECTRIC** CO.
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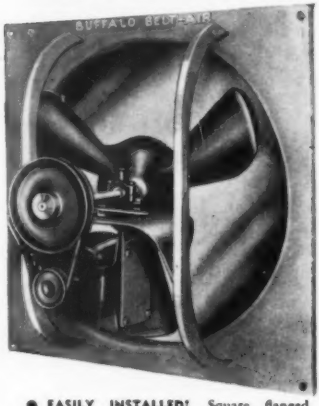
For a Simple, Satisfactory Job— THEY ALL WANT BELT-AIR



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- **EFFICIENT! ATTENTION-FREE!** Blades shaped to move maximum air—all parts simply designed.
- **HUSKY CONSTRUCTION!** Rigid bracket arms, heavy-duty bearings make these fans stand up for years of quiet operation.
- **24" to 48" SIZES**—up to 19,000 cfm—to handle many of your big-volume jobs.
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"Buffalo" FIRST FOR FANS

Corp., was the speaker. He used as title for his talk "Getting Along With People—the Key to Production."

An evening session was devoted to "Lighting for Increased Production." The speaker was Will S. Fisher, Engineering Division of the Lamp Department, General Electric Co., Nela Park. This meeting was co-sponsored by the Pittsburgh Section of the Illuminating Engineering Society. This talk, highlighted by vivid demonstrations, included the relation of lighting to production and accidents, modern office and drafting room lighting, industrial lighting equipment, inspection lighting, and suggestions for increasing production through the better application and increased use of good lighting.

Other speakers on the program were Richard P. Bell and Joseph C. Thompson, Pittsburgh Plate Glass Company, and B. A. Fleming and C. F. Kreiser, Edwin L. Wiegand Co., Pittsburgh. Mr. Bell gave an expert interpretation of color design in its residential application, for the ladies who visited the Exposition. Mr. Thompson keyed his discussion to the applications of paint as protective coatings, and to an analysis of the scientific use of color as an adjunct to production acceleration. Mr. Fleming and Mr. Kreiser, discussed a new type of infrared heating with typical applications of this and other late developments in electric heating.

Carl J. Long, consulting engineer in Pittsburgh, was general chairman for the conferences and exposition. He was assisted by R. L. Whitney, National Electrical Products Corp., T. M. Lukens, General Electric Co; Charles R. Taylor, Allis-Chalmers Mfg. Co; Fred F. Dickman, West Penn Power Co; and L. T. Lamberger and J. W. Onan, Duquesne Light Co, all of Pittsburgh.

THE COPPER SITUATION is gloomy, W. C. Cade (left), Anaconda Wire and Cable Co., Des Moines, Ia., tells electrical inspectors C. B. Kuntz, Dayton, Ohio; and Harold Bielke, Rochester, Minn. Place: IAEI meeting in Omaha.

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All Add Up to Good Business

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(FOR ALL NEEDS)
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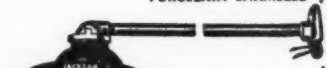

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Yardlights modern in design, completely wired and assembled, of one-piece heavy gauge steel, finished with three coats of VITREOUS PORCELAIN ENAMEL. *Withstand wind and weather.* Listed by U. L.—approved for R.E.A. installations. **Available immediately at your distributor.** Send for complete information.

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Manufacturers of
Reflectors • Yard Lights • Vapor proof units
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A Live Wire is no better than its Connections

DUPLEX LUGS

Square end—one or two attaching bolt holes. Accurately machined all contact surfaces parallel. Receives two or more conductors of different sizes with equal pressure. Wire sizes 4-1 to 900,000CM.

FLEXIBLE CABLE CLAMP LUGS

Two or four bolts, designed to meet requirements where a single lug adequately applies to several size conductors. Cover range of wire sizes from 1-1/0 to 2,000,000CM solid or stranded.

PRESSURE TYPE CAST CLAMP TERMINAL LUGS

One or two bolt holes. Lugs one piece designed for one wire size to give conductivity and contact surface equal to capacity of wire. All contact surfaces ground, faces parallel, wire sockets machined. Wire sizes 1 to 2,000,000CM.

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KRUEGER & HUDEPOHL
CINCINNATI, OHIO

Leagues Held Annual Conference

The International Association of Electrical Leagues held its 16th Annual Conference at the Hotel Roosevelt, New Orleans, La., October 10-13. This meeting was attended by the managers of 30 electrical leagues from all sections of the United States and one from Canada.

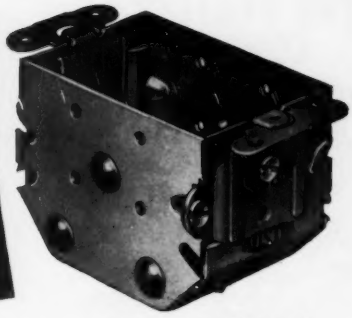
A wide variety of subjects, selected especially to draw forth information needed by our industry in these difficult times, was discussed by speakers who are among our leading authorities on their respective topics. Included in these were "The General Economic Situation"; "Appliance Marketing—Today and Tomorrow"; "Why My Utility Thinks It Is Good Business to Support an Electrical League"; "Current Legal Decisions Affecting Trade Associations"; "Recent Developments in the Field of Television"; "Service—Plus or Minus"; "Effects of the Arsenal Economy Situation on Availability of Critical Materials for Manufacturers of Electrical Appliances and Equipment"; "The League's Place in Maintaining Industry Morale and Keeping the Public Informed"; "Sure, Electrical Contractors Are Interested in Adequate Wiring!" and "What's the Matter with Advertising and Promotion?"

There were also two forums, one a general question and answer period on league operations and the other dealing with such matters as "Grass Roots Meetings for Farmers", "Electric Bedcovering Promotion", "Television Service Training Program", Light Conditioning", "Wiring Under Current Copper Limitations".

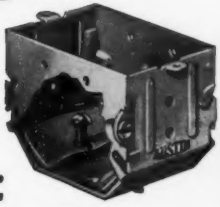
A Preview of 1952 Industry Programs included, "The New Mother-Daughter Program", of the Edison Electric Institute; "NEMA Appliance Sections' Promotional and Educational Programs" and "Engineering for Today—Education for Tomorrow," of the National Adequate Wiring Bureau. These were respectively handled by Messrs. W. T. Clark, Chairman of the Electric Kitchen and Laundry Committee of the EEI; W. J. Donald, Managing Director of the National Electrical Manufacturers Association and Miss Frances Armin, Director of Consumer Education of the NAWB.

Hutson Colcock, president of the Electrical Association of New Orleans, welcomed the conferees. Mr. Colcock then made a brief address outlining, "The League's Place in an Arsenal Economy." Acknowledgment under the title "The Leagues Are Ready" was made by R. B. Hubbard, vice president of the IAEL. J. G. Waddell, president, served as General Chairman.

AUSTIN'S *Improved* LR BOX



Nails to Studding Evenly, Accurately, in a Matter of Seconds . . .



For use in Old or New Wiring

Faster Installation!
Nail holes in box sides provide fast, easy installation. Saves money by eliminating bracket. Nail heads driven in tight—box is never out of line.

Perfect Alignment!
3 nubs facing outward on each side of box prevent box from tilting. First nub is 7/8" from front of box to permit adjustment for wallboard or plaster.

The M. B. Austin Company
NORTHBROOK, ILLINOIS

Write for descriptive price sheet No. A-1-a

For Modern Time Control ...The "Model W" by Reliance

● The Reliance "Model W" is simple in design, economical, and thoroughly dependable. Available in three types, this modern Reliance Switch covers practically every time control requirement. Heavy contacts are of pure silver and the entire switch is approved by Underwriters' Laboratories for 30 Amperes at 125/250 volts. Reduction gears of the synchronous motor run in oil and the housing is sealed for lifetime lubrication. Constructed throughout of the very best materials, the "Model W" is built to the high standards of quality maintained for forty years in the Reliance line. For complete information write:

Reliance Automatic Lighting Co.
1937 Mead Street Racine, Wisconsin

RELIANCE TIME SWITCHES

THE PERFECT COMBINATION...

SKILLED ELECTRICIANS

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CHANNELLOCK PLIERS!

Made only by
CHAMPION DEARMENT

Channellock pliers are listed in the Yellow Pages of most Telephone Directories under "Tools"

No electricians' tool kit is complete without strong, durable, easily adjusted, versatile Channellock pliers. On almost any type of electrical work pliers are used . . . and where pliers are used, You Need Channellock. Channellock pliers are made Only by Champion DeArment with nearly 3/4 of a century of experience in making highest quality tools. Ask to see Channellock pliers — you'll immediately know they're the best. And remember—Only Champion DeArment makes Channellock. Send for Catalog D-8 today.

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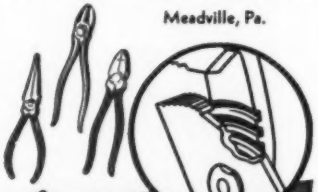

Only CHAMPION DEARMENT makes... CHAN NEL LOCK

CODE INTERPRETATIONS prompted serious reflection and comment on the parts of Larry McNeil of Consolidated Edison of New York, and Thomas Kirkman, president of the Kirkman Engineering Corporation at IAEI Eastern meeting.

There were two special luncheons. At the Wednesday, October 10 luncheon, Professor Clifton L. Ganus, Jr., of Harding College, Searcy, Arkansas, spoke on "Americanism and the Free Enterprise System." At the Friday luncheon S. L. Drumm, Vice President of the New Orleans Public Service Inc., addressed the gathering on, "The Joint Utility Program for Industrial Development of the Middle South."

The subjects on the general program were presented respectively by Dexter M. Keezer, director, department of Economics, McGraw-Hill Publishing Company, New York; C. W. Leihy, publisher *Electrical Dealer*, Chicago, Illinois; W. T. Clark, manager, Residential Sales, Cleveland Electric Illuminating Company, Cleveland, Ohio and R. C. Hienton, general sales manager, Cleveland Electric Illuminating Company, Cleveland, Ohio (joint presentation); Henry P. Fowler, general counsel and manager, Trade Association Department, Chamber of Commerce of the United States of America, Washington, D. C.; Glen McDaniel, president, Radio-Television Manufacturers Association, Washington, D. C., H. E. Putnam, customer service manager, Landers Frary & Clark, New Britain, Connecticut; Harry J. Holbrook, director, Consumer Durable Goods Division, National Production Authority, Washington, D. C.; K. G. Gillespie, vice president, The Electric Association of Kansas City, Missouri; Fred Sudduth, electrical contractor and appliance dealer, Marshall, Texas and E. J. Hegarty, director sales training, Westinghouse Elec. Corp., Mansfield.

On October 13, the election of members of the Board for the year 1951-52 resulted in the following: president—J. G. Waddell, Boston, Mass.; v.p.—R. B. Hubbard, Denver, Colorado; treasurer—A. L. Maillard, Indianapolis, Indiana; and secretary—J. A. Morrison, Philadelphia, Pa.

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Lighting-at-Work Show

The Westinghouse Electric Corporation has a "Lighting-at-Work" show presently touring major U. S. cities. Already shown in Buffalo, Rochester, Syracuse and New York City, this 90-minute presentation is scheduled to run through the fall, winter, and spring of 1951-52. Using as its theme "Fit the Design to the Use," it is primarily designed to be of interest to architects, consulting engineers, utility lighting service people and other lighting men.

Presented in skit form, this show is an initial step in a program designed to provide more and better information to engineers who specify and use lighting equipment. It analyzes—with slides, movies, charts, and discussion between two pseudo architects in a simulated architect's office—lighting application problems encountered in offices, drafting rooms, and various types of industrial areas.

Although the skit is dead serious in its theme, it follows a humorous vein. The simulated architect's office which provides the setting for the main scene is ingeniously equipped with a Tele-Memory machine that brings into focus past and future industrial and commercial lighting applications. With these giant pictures before them, the architects (W. H. Kahler and Sam Davies, Westinghouse lighting application engineers, play the part of two architect pardners in business) trace out the particular application problems encountered and go over the resulting installation.

In many cases, "before" as well as "after" slides are used to show the improvement obtained in both quantity and quality of light. Bar charts are used to compare the relative costs of incandescent and mercury-arc lighting of low and high bay areas, and the merits and disadvantages of lead-lag and series ballasts are covered frankly.

HOW'S THIS, asks E. H. Rueppel, secretary-treasurer, Kentucky Chapter, IAEI, as he hands 20 new memberships to Fred P. Oliver, co-chairman, IAEI membership committee at Omaha meeting. Kentucky's score so far: 78 new members this year.

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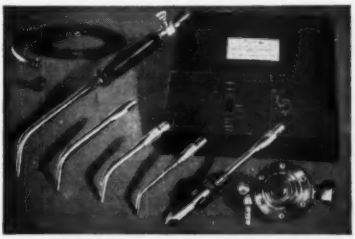

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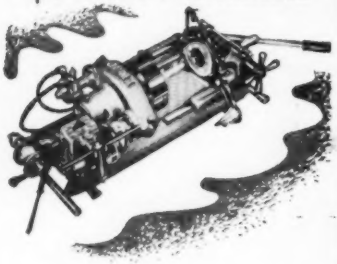

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Among the Manufacturers

Headquarters Announcements

Allis-Chalmers Mfg. Co., Milwaukee, Wis.—R. M. Casper, manager of the newly formed power department.

The Rawlplug Co., Inc., New York, N. Y.—Frederic B. Powers, president.

General Electric Company, Schenectady, N. Y.—John W. Belanger and Nicholas M. DuChemin, vice-presidents.

F. H. Smith Mfg. Co., Chicago, Ill.—A. R. Grabe, national sales manager of the Fireguard fuse coupling.

Fluorescent Fixtures of Calif., San Francisco, Calif.—Robert Thallon, head of the department of designs engineering.

Line Material Co., Milwaukee, Wis.—R. G. Wheaton, sales manager.

The Black & Decker Mfg. Co., Towson, Md.—John F. Spaulding, sales manager.

U. S. Rubber Co., New York, N. Y.—H. Gordon Smith, executive vice president.

Union Insulating Co., Parkersburg, West Va.—T. E. Graham, III, sales manager.

Duro-Test Corp., North Bergen, N. J.—William F. Bayne, head of new subsidiary, Duro-Test of California.

Rome Cable Corp., Rome, N. Y.—

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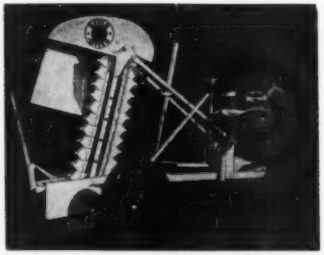

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George W. Acock, product application engineer.

Howell Electric Motors Co., Howell, Mich.—James F. Murphy, vice president in charge of sales.

Allis-Chalmers Mfg. Co., Milwaukee, Wis.—C. W. Schweers, vice president in charge of sales for general machinery division; J. F. Roberts, vice president in charge of engineering.

General Electric Company, Schenectady, N. Y.—Sam Littlejohn, commercial vice president; James M. Crawford, general manager of the Motor and Generator division; Francis E. Fairman, Jr., general manager of the Transformer and Allied Products division; George E. Burens, general manager of the Switchgear and Control division; Harold E. Strang, general manager of the Measurements and Industrial Products division; William C. Wichman, general manager of the Component Products division.

Rhode Island Insulated Wire Co., Providence, R. I.—Alan B. Anixter, vice president in charge of sales.

Regional Appointments

MIDDLE ATLANTIC

General Electric Company: F. Charles Ruling, Philadelphia, Pa., manager of the Atlantic district of the Apparatus Sales division; James J. Fitzgibbon, Washington, D. C., manager of the Apparatus Sales office; Dorcey F. Hines, Philadelphia, Pa., Atlantic district sales manager for major appliances; Lee D. Nutter, New York, N. Y., sales manager for major appliances, New York district.

Line Material Company: R. E. Peterson, Philadelphia, Pa., manager of the eastern sales division.

Westinghouse Electric Corp.: Harry F. Fox, manager of the Belleville, N. J., plant of the lamp division.

Sylvania Electric Products, Inc.: Raymond P. Connors, eastern sales manager of the lighting division; Thomas G. Hearn, manager of the New York State division of the lighting division.

EAST CENTRAL

Globe Lighting Products, Inc.: Herman R. Levi, Pittsburgh, Pa., representative for western Pennsylvania, West Virginia and eastern Ohio.

Allis-Chalmers Mfg. Co.: Tom W. Metz, manager of the Indianapolis, Ind., district of the general machinery division: Robert F. Loos, manager of the Evansville, Ind., district of the general machinery division.

Graybar Electric Company: H. J. Mittelstaedt, manager of the Flint, Mich., branch.

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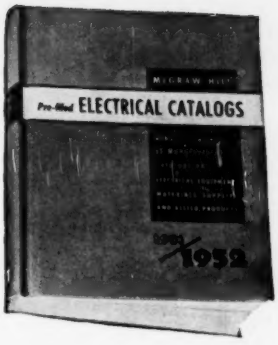

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WEST CENTRAL

General Controls Company: Eldon Burnett, manager of the newly opened branch at Omaha, Nebraska; Robert C. Servat, manager of the new branch office in New Orleans, La.

Globe Lighting Products, Inc.: A. M. Orlick, representative for the southeast and southwest; John J. Jasin, Chicago, Ill., representative for Illinois, Iowa, Nebraska, Kansas, Missouri and Wisconsin.

Northern Light Company: Russ Gerde and Merrill Pearson, Minneapolis, Minn., representatives for Minnesota, Iowa, the Dakotas and parts of Wisconsin, Nebraska and Montana.

Graybar Electric Company: John Reine, Minneapolis, Minn., district manager; F. A. Sjogren, manager of the Duluth, Minn., branch.

Westinghouse Electric Corp.: Harry A. Holden, manager of the new Paris, Texas, plant of the lamp division.

WEST

Blackhawk Mfg. Co.: Bernard Robertson, representative for Oregon, Washington, northern California, Nevada and northern Idaho; Sterling Couch, representative for western Arkansas and eastern Oklahoma.

General Electric Company: W. A. Brown, San Francisco, Calif., Pacific district service representative for the major appliance division; Robert T. Skeer, Seattle, Wash., manager of major appliance sales.

Allis-Chalmers Mfg. Co.: Thomas K. Hawkins, sales representative in Los Angeles, Calif., office.

Graybar Electric Company: P. D. Barber, manager, Portland, Oregon.

TWO JOHN J's; Hennessey (center) and Reddington (right); trade Brookline, Mass., inspection problems and Boston contracting trends with Larry Reid, wire inspector from Arlington, Mass.

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SALES MANAGEMENT FOR AN ELECTRICAL CONTRACT BUSINESS

[FROM PAGE 66]

ice trucks is definitely limited in potential volume of work because of its nature, it can be deduced that a large fleet of trucks is required to attain a volume that is profitable. A typical budget for operating a Service Department appears in Fig. 4.

In addition to a large administrative overhead expense, there are other overhead expenses which are unusual in nature and particular to this type of work. These are: advertising, truck rental, uniforms for electricians, large warehouse stocks of material, and an adequate stock of small tools.

To insure the steady, continuous operation of the Service Department it is necessary to develop and maintain a Sales Program. Some of the more promising possibilities are:

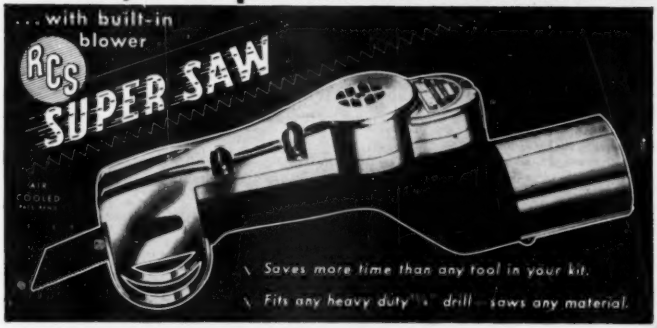
1. Appliance Installation Contracts
2. Heating and Furnace Control Installation and Maintenance Contracts
3. Plant Maintenance Contracts
4. Lighting Maintenance and Service Contracts

Take heating control as an example. Most heating contractors are considerably distressed by the electrical features of their business. Heating controls present more of a problem every day as the installations become more involved. There is a ready acceptance for someone to relieve them of the responsibility of maintaining such control systems.

To establish contract considerations for this work would first require a determination of the number of installations which could be done during this period of time. An allocation of the total maintenance cost based on the above percentages to the total number of jobs would be the maintenance cost for the entire operation. By adding to this average maintenance cost, the cost of control wiring and installation, a total *contract price* can be easily developed.

These contracts are highly acceptable to the customer because they enable him to accurately budget his operating costs and insure him of uninterrupted, continuous operation. They are desirable to the contractor because they insure him "fill-in" business to keep his trucks operating steadily. In a second article this discussion on sales management possibilities and techniques will be continued.

A Journeyman's Tool, built to stand up under constant, on-the-job Contractor or Industrial use



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LIMITED SPACE! AN ENGINEERING CHALLENGE

[FROM PAGE 76]

mounting, with wiring troughs extending upwards to conduit junctions at column tops. Panels are 3-phase 4 wire, with 5-pole main breakers, solid neutrals and single-pole 20-amp air breakers for all lighting and receptacle circuits. Lighting loads are distributed evenly over the 3 phases, with each section of the plant served by at least six separate circuits to provide flexibility of control and continuity of lighting service. Neutrals of all lighting transformers are grounded, as are the frames of all motors, electrical equipment, switches, conduits, racks and building steel. Minimum wire size is 12-gauge for power and lighting; 14-gauge for control circuits. Insulation is generally type R, except in damp locations and beneath flooring where it is either TW or RW.

This assembly plant, engineered and constructed by the Wigton-Abbott Corporation of Plainfield, New Jersey, and wired by the Lord Electric Company of New York City, is an example of good modern design and construction. And, with the precision installation of the substation in confined quarters, the remote control switching system for high-voltage equipment, the banked secondary distribution system, and the careful attention to details as evidenced in the lighting suspension, it is likewise an example of analytical planning and sound installation techniques.

FITTING APPROVAL went from Warren J. Alcock, Underwriters' Laboratories, Chicago (right), to Carl H. Bissell, chief engineer for the Crouse-Hinds Company in Syracuse.

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- washing machines
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- food mixers
- irons and ironers
- sewing machines
- ranges
- vacuum cleaners
- clothes dryers
- garbage disposers
- water heaters
- coffee makers
- clocks
- dishwashers
- etc.

"What a book! Just crammed full of useful information, it deals with everything from electric irons and toasters to electric dishwashers and washing machines. Written in practical and everyday language and profusely illustrated throughout, the work will enable the service man to determine trouble spots in the quickest possible time and will provide him with the know-how to tackle the problem and solve it."
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TESTED RULES FOR MOTOR MAINTENANCE

[FROM PAGE 73]

dition should be replaced with new ones.

41. Check the contact gap, for too great a gap will reduce the pull.

42. Dash pots should operate easily, without sticking. Keep oil from assembled parts of air dash-pots and do not use sandpaper for repair work. Take unit apart, remove solenoid, clean out gum and dust with kerosene or similar solvent, oil (sparingly) the felt washer and wet the inside of the cylinder with a slight oil film. After cleaning oil dash pots, fill them to their specified level.

43. Mercury dash pots should be *replaced* rather than repaired.

44. Pushbuttons should be cleaned and tested at regular intervals to keep them clean and free from oil.

Since unusual or abnormal conditions frequently can be detected through odor or sound as well as appearance, *look, smell and listen* intently during each inspection trip.

Also remember that electrical maintenance *can be* hazardous, and that familiarity *can breed* carelessness and neglect. Take time to be safe. It hurts to get hurt.

Whenever manufacturers' instructions are available, *follow them.* They were written to protect the equipment.

Refer to these instructions until you are *thoroughly familiar* with them. Follow these suggestions faithfully, and supplement them with *common sense.*

NOTE PAD AND FORMULAE were used to prove the theories of Sam Rosch (Anaconda) to H. M. Selzer, Jr., of Philadelphia, as they inspected the 26 product exhibits at the Atlantic City 3-day conclave of the IAEI.

SEARCHLIGHT SECTION

Classified Advertising

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UNDISPLAYED —RATES—	DISPLAYED
$1.20 per line, minimum 3 lines. To figure advance payment count 5 average words as a line. *Position Wanted and Individual Selling Opportunity* undisplayed rate is one-half of above rate, payable in advance. *Box Numbers* in care of our New York, Chicago & San Francisco offices count as one additional line. *Discount of* 10% if full payment is made in advance for 4 consecutive insertions.	*Equipment Wanted or For Sale Advertisements* acceptable only in Displayed Style. *Individual Spaces* with border rules for prominent display of advertisements. The advertising rate is $11.00 per inch for all advertising appearing on other than a contract basis. Contract rates quoted on request. *An Advertising Inch* is measured ⅞" vertically on one column, 3 columns—30 inches—to a page.

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CHICAGO: 520 N. Michigan Ave. (11)
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POSITION WANTED

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CONSULT: Z. H. POLACHEK, Reg. Patent Attorney, 1234 Broadway, New York 1, N. Y.

WANTED

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Of Electrical Construction and Maintenance published monthly at Albany, New York, for October 1, 1951.

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(My commission expires March 30, 1952)

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Basic Starter Mechanism

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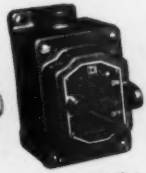
a Variety of Enclosures

General purpose enclosure—with or without pilot light

Water-tight and dust-tight enclosure

Water-tight and dust-tight with pilot light



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Single pole
1 H.P., 115-230 volts A.C. and ½ H.P., 115-230 volts D.C.

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G-E TIME-DELAY RENEWABLE FUSES

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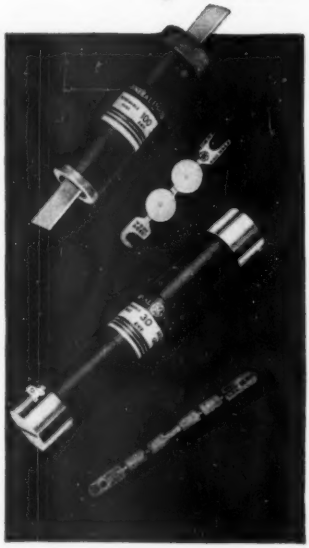

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